APPENDIX A

COST ANNUALIZATION MODEL

Figure A-1 provides an overview of the cost annualization model. Inputs to the model come from three sources: 1) the capital, one-time non-equipment, and operating and maintenance (O&M) costs for incremental pollution control developed by EPA, 2) financial data taken from the *Collection of 1997 Iron and Steel Industry Data, Part B: Financial and Economic Data* (1997 Questionnaire; U.S. EPA, 1998), and 3) secondary sources. The cost annualization model calculates four types of compliance costs for a site:

- # Present value of expenditures—before-tax basis
- # Present value of expenditures—after-tax basis
- # Annualized cost—before-tax basis
- # Annualized cost—after-tax basis

There are two reasons why the capital and O&M costs should be annualized. First, the initial capital outlay should not be compared against a site's income in the first year because the capital cost is incurred only once in the equipment's lifetime. That initial investment should be spread over the equipment's life. Second, money has a time value. A dollar today is worth more than a dollar in the future; expenditures incurred 15 years from now do not have the same value to the firm as the same expenditures incurred tomorrow.

The cost annualization model is defined in terms of 1997 dollars because 1997 is the most recent year for which financial data are available from the survey. Pollution control capital and operating and maintenance costs are estimated in 1997 dollars and used to project cash outflows. The cash outflows are then discounted to calculate the present value of future cash outflows in terms of 1997 dollars. This methodology evaluates what a business would pay in constant dollars for all initial and future expenditures. Finally, the model calculates the annualized cost for the cash outflow as an annuity that has the same present value of the cash outflows and includes the cost of money or interest. The annualized cost is analogous to a mortgage payment that spreads the one-time investment of a home into a defined series of monthly payments.

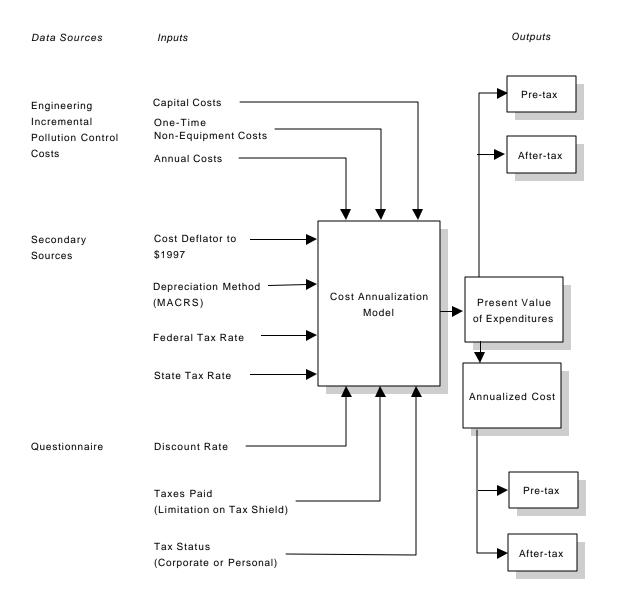


Figure A-1
Cost Annualization Model

Section A.1 discusses the data sources for inputs to the cost annualization model. Section A.2 summarizes the financial assumptions in the model. Section A.3 presents all steps of the model with a sample calculation.

A.1 INPUT DATA SOURCES

A.1.1 EPA Engineering Cost Estimates

The capital, one-time non-equipment, and operating and maintenance (O&M) costs used in the cost annualization model are developed by EPA's engineering staff. The capital cost is the initial investment needed to purchase and install the equipment; it is a one-time cost. Unlike capital costs, a one-time non-equipment cost cannot be depreciated because it is not associated with property that can wear out. An example of such a cost is an engineering study that recommends improved operating parameters as a method of meeting effluent limitations guidelines. No capital cost is associated with the plan's implementation. Such one-time costs are expensed in their entirety in the first year of the model. The O&M cost is the annual cost of operating and maintaining the equipment. O&M costs are incurred every year of the equipment's operation.

A.1.2 Questionnaire Data

The *discount/interest rate* is the either the weighted average cost of capital or the interest rate that a site supplied in the 1997 Questionnaire—whichever is higher (as long as it falls between 3 and 19 percent). It is used to calculate the present value of the cash flows. The discount rate represents an estimate of a site's marginal cost of capital, i.e. what it will cost the site to raise additional money for capital expenditure whether through debt (a loan), equity (sale of stock), or working capital (opportunity cost). The discount rate or weighted cost of capital is calculated as:

Discount rate = (interest rate * % of capital raised through interest) +

(equity rate * % of capital raised through equity [stock])

For companies that do not use a discount rate, or provide a discount rate less than 3 percent or greater than 19 percent, the interest rate is used in the calculations. If no information was provided or if both the discount and interest rates fall outside the 3 percent to 19 percent range, the median discount rate is used in the cost annualization model. The discount rate is assumed unaffected by the need to finance the purchase of pollution control equipment in order to comply with the regulation; in other words, the capital structure of the firm is assumed to be unchanged by the regulation (Brigham, 1997). Nineteen sites did not report either a discount or an interest rate. These sites finance expenditures through working capital. For these sites, we assign the median discount rate as the opportunity cost of capital.

Corporate structure is derived from survey data for the purpose of estimating tax shields on expenditures. A C corporation (corporate structure = 1) pays federal and state taxes at the corporate rate. An S corporation or a limited liability corporation (corporate structure = 3) distributes earnings to the partners and the individuals pay the taxes. Unfortunately, we do not know either the number of individuals among whom the earnings are distributed or the tax rate of those individuals. For the purpose of the analysis, the tax rate for S corporations and limited liability corporations is presumed to be zero.² All other entities (corporate structure = 2) are assumed to pay taxes at the individual rate.

Taxable income is the business entity's earnings before interest and taxes (EBIT). The value sets the tax bracket for the site.

Average taxes paid is calculated from the 1995, 1996, and 1997 taxes paid by the business entity. It is used to limit the tax shield to the typical amount of taxes paid in any given year.

¹ A rate less than 3 percent is suspiciously low given that, in 1997, banks charged a prime rate of 8.44 percent and the discount rate at the Federal Reserve Bank of New York was 5 percent (CEA, 1999). A rate greater than 19 percent is more likely to be an internal "hurdle" rate—the rate of return desired in a project before it will be undertaken. All but one of sites provided a discount rate that fell into the accepted range.

²The effect of this assumption is to assume there is no tax shield for S corporations and limited liability corporations (LLCs). S corporations and LLCs will see no change in tax shield benefit because they do not pay taxes. The persons to whom the income is distributed, however, will see the change in earnings due to incremental pollution control costs; there is no tax shield benefit.

A.1.3 Secondary Data

The cost annualization model is developed in terms of constant 1997 dollars, so the discount/interest rate must be adjusted for inflation before used in the model. That is, we need to change the discount rate from the nominal value supplied in the questionnaire to the inflation-adjusted real value. Table A-1 lists the average inflation rate from 1987 to 1997 as measured by the Consumer Price Index. The 10-year average inflation rate of 3.5 percent is used in the cost annualization model as the expected average inflation rate over the 15-year life of the project to convert the nominal discount rate to a real discount rate. The nominal discount rate is deflated to the real discount rate using the following formula (OMB, 1992):

Real Discount Rate =
$$(1 + Nominal Discount Rate)$$
 - 1
 $(1 + Expected Inflation Rate)$

The median nominal discount rate for the industry (8.2 percent) is equivalent to a real discount rate of 4.5 percent using this formula.

Table A-2 lists each state's top corporate and individual tax rates and calculates national average state tax rates (CCH, 1999a). The cost annualization model uses the average state tax rate because of the complexities of the industry; for example, a site could be located in one state, while its corporate headquarters are located in a second state. Given the uncertainty over which state tax rate applies to a given site's revenues, the average state tax rate—rounded to three decimal points—is used in the cost annualization model for all sites, i.e., 6.6 percent corporate tax rate and 5.6 percent personal tax rate.

The cost annualization model incorporates variable tax rates according to the type of business entity and level of income to address differences between small and large businesses. For example, a large business might have a combined tax rate of 40.6 percent (34 percent Federal plus 6.6 percent State). After tax shields, the business would pay 59.4 cents for every dollar of incremental pollution control costs. A small business, say a small sole proprietorship, might be in the 20.8 percent tax bracket (15 percent Federal plus 5.8 percent State). After tax shields, the small business would pay 79.2 cents for every dollar of

Table A-1 Inflation Rate 1987-1997

	Consumer	
	Price	
Year	Index	Change
1987	113.6	
1988	118.3	4.1%
1989	124.0	4.8%
1990	130.7	5.4%
1991	136.2	4.2%
1992	140.3	3.0%
1993	144.5	3.0%
1994	148.2	2.6%
1995	152.4	2.8%
1996	156.9	3.0%
1997	160.5	2.3%
Average Inflation Rat	e	3.5%
Č		

Source: CEA, 1999, Table B-60.

Table A-2 State Income Tax Rates

		Basis for States		Basis for States
	Corporate Income	With Graduated	Personal Income Tax	With Graduated
State	Tax Rate	Tax Tables	Upper Rate	Tax Table
Alabama	5.00%		5.00%	\$3,000
Alaska	9.40%	\$90,000+	0.00%	
Arizona	8.00%	4 ,	5.04%	\$150,000
Arkansas	6.50%	\$100,000+	7.00%	\$25,000
California	6.65%	,	9.30%	\$47,000
Colorado	4.75%		4.75%	, ,,
Connecticut	7.50%		4.50%	\$10,000
Delaware	8.70%		6.40%	\$60,000
Florida	5.50%		0.00%	***,***
Georgia	6.00%		6.00%	\$10,000+
Hawaii	6.40%	\$100,000+	8.75%	\$40,000
Idaho	8.00%	,,	8.20%	\$20,000
Illinois	4.80%		3.00%	Ψ20,000
Indiana	3.40%		3.40%	
Iowa	12.00%	\$250,000+	8.98%	\$52,000+
Kansas	4.00%	\$230,000	6.45%	\$30,000
Kentucky	8.25%	\$250,000+	6.00%	\$8,000
Louisiana	8.00%	\$200,000+	6.00%	\$50,000
M aine	8.93%	\$250,000+	8.50%	\$33,000
M ary land	7.00%	\$230,000	4.80%	\$3,000
M assachusetts	9.50%		5.95%	\$3,000
M ichigan	2.20%		4.40%	
M innesota	9.80%		8.00%	\$50,000
		610.000		
M ississippi	5.00%	\$10,000+	5.00%	\$10,000
M issouri M ontana	6.25%		6.00%	\$9,000
Nebraska	6.75%	\$50,000	11.00%	\$71,000
	7.81%	\$50,000+	6.99%	\$27,000
Nevada	0.00%		0.00%	
New Hampshire	8.00%		0.00%	075.000
New Jersey	7.25%	013.6:11:	6.37%	\$75,000
New Mexico	7.60%	\$1M illion+	8.20%	\$42,000
New York	7.50%		6.85%	\$20,000
North Carolina	7.50%	450.000	7.75%	\$60,000
North Dakota	10.50%	\$50,000+	12.00%	\$50,000+
Ohio	8.50%	\$50,000+	7.30%	\$200,000
Oklahoma	6.00%		7.00%	05.000
Oregon	6.60%		9.00%	\$5,000
Pennsy Ivania	9.99%		2.80%	
Rhode Island *	9.00%		10.40%	\$250,000+
South Carolina	5.00%		7.00%	\$12,000
South Dakota	6.00%		0.00%	
Tennesee	6.00%		0.00%	
Texas	0.00%		0.00%	
Utah	5.00%		7.00%	\$7,500
Vermont *	9.75%	\$250,000+	9.45%	\$250,000+
Virginia	6.00%		5.75%	\$17,000
Washington	0.00%		0.00%	
West Virginia	9.00%		6.50%	\$60,000
Wisconsin	7.90%		6.77%	\$15,000
Wyoming	0.00%		0.00%	
Average:	6.58%		5.59%	

Notes: Basis for rates is reported to nearest \$1,000.

Personal income tax rates for Rhode Island and Vermont based on federal tax (not taxable income).

Tax rates given here are equivalents for highest personal federal tax rate.

Source: CCH, 1999a. 2000 State Tax Handbook. Chicago, IL: CCH.

incremental pollution control. The net present value of after-tax cost is used in the closure analysis because it reflects the long-term impact on its income the business would actually experience.

All costs will be deflated to 1997 dollars, if necessary, for the cost annualization model. The Construction Cost Index published by the weekly *Engineering News Report*, is the indexed used for this purpose (ENR, 2000).

A.2 FINANCIAL ASSUMPTIONS

The cost annualization model incorporates several financial assumptions:

- # Depreciation method is the Modified Accelerated Cost Recovery System (MACRS).³
 MACRS applies to assets put into service after December 31, 1986. MACRS allows businesses to depreciate a higher percentage of an investment in the early years and a lower percentage in the later years.
- # There is a six-month lag between the time of purchase and the time operation begins for the pollution control equipment. A mid-year depreciation convention may be used for equipment that is placed in service at any point within the year (CCH, 1999b, ¶1206). EPA chose to use a mid-year convention in the cost annualization model because of its flexibility and the likelihood that the equipment considered for pollution control could be built and installed

Section 169 provides an option to amortize pollution control equipment over a 5-year period (RIA, 1999). Under this provision, 75 percent of the investment could be rapidly amortized in a 5-year period using a straight-line method. The 75 percent figure is based on the ratio of allowable lifetime (15 years) to the estimated usable lifetime (20 years) as specified in Section 169, Subsection (f). Although the tax provision enables the site to expense the investment over a shorter time period, the advantage is substantially reduced because only 75 percent of the capital investment can be recovered. Because the benefit of the provision is slight and sites might not get the required certification to take advantage of it, the provision was not included in the cost annualization model

EPA also considered the Section 179 provision to elect to expense up to \$24,000 if the equipment is placed into service in 2001 or 2002 (RIA, 1999). The deduction increased to \$25,000 if the equipment is placed into service in 2003 or later. EPA assumes that this provision is applied to other investments for the business entity. Its absence in the cost annualization model may result in a slightly higher estimate of the after-tax annualized cost for the site.

³EPA examined straight-line depreciation, Internal Revenue Code Section 169 and 179 provisions as well as MACRS for depreciation. Straight-line depreciation writes off a constant percentage of the investment each year. MACRS offers companies a financial advantage over the straight-line method because a company's taxable income may be reduced under MACRS by a greater amount in the early years when the time value of money is greater.

within a year of initial investment. Because a half-year of depreciation is taken in the first year, a half-year needs to be taken in the 16th year of operation. Consequently, the cost annualization model spans a 16-year time period.

The pollution equipment has an operating lifetime or class life between 20 and 25 years. It is considered 15-year property.

The depreciable life of the asset is based on, but is not equivalent to, the useful life of the asset. The Internal Revenue Service (IRS) establishes different "classes" of property. For example, a race horse is 3-year property. The Internal Revenue Code Section 168 classifies an investment as 15-year property if it has a class life of 20 years or more but less than 25 years. Section 168(e)(3)(E) lists a municipal wastewater treatment plant as an example of 15-year property (CCH, 1999b, ¶1240; RIA, 1999). The cost annualization model, therefore, incorporates a 15-year depreciable lifetime. Thus, for the purpose of the calculating depreciation, most components of the pollution control capital costs considered in this analysis would be 15-year property. According to IRS requirements, pollution control equipment can be depreciated, but the total cost of the equipment cannot be subtracted from income in the first year. In other words, the equipment must be capitalized, not expensed (CCH, 1999b, ¶991; and RIA, 1999, Section 169).

A.3 SAMPLE COST ANNUALIZATION SPREADSHEET

In Table A-3, the spreadsheet contains numbered columns that calculate the before- and after-tax annualized cost of the investment to the site. The first column lists each year of the equipment's life span, from its installation through its 15-year depreciable lifetime.

Column 2 represents the percentage of the capital costs that can be written off or depreciated each year. These rates are based on the MACRS and are taken from CCH (1999b). Multiplying these depreciation rates by the capital cost gives the annual amount the site may depreciate, which is listed in Column 3. Depreciation expense is used to offset annual income for tax purposes; Column 4 shows the potential tax shield provided from the depreciation expense—the overall tax rate times the depreciation amount for the year.

Column 5 is the annual O&M expense and the one-time non-equipment cost. In this example, Year 1 shows the one-time non-equipment investment cost (\$10,000) plus six months of O&M ($$1,000 \div 2$

Table A-3 Iron and Steel Cost Annualization Model

666

SEDIAN								
Survey ID #:	666						disc_rate	7.0%
Option Number:							corp_tax	1
	1997	1997			Engineering Inputs Economic Analysis	conomic Analysis	ebit	\$23,000
Initial Capital Cost (\$):	\$100,000	\$100,000	Year	Year Dollars	1997	1997	opt_cap	\$100,000
Annual Operation & Maintenance Cost (\$):	\$1,000	\$1,000	ENR	CCI	5826	5826	opt_om	\$1,000
One-Time Non-Equipment Cost (\$):	\$10,000	\$10,000					one \$	\$10,000
Facility-Specific Nominal Discount/Interest Rate:	7.0%	Federal	Federal Corp. Tax Table:	Federa	Federal Personal Tax Table:		tax_95	\$3,000
Expected Inflation Rate:	3.5%		Taxable	Average	Taxable	Average	tax_96	\$3,000
Real Discount Rate:	3.4%		Income	Effective	Income	Effective	tax_97	\$1,000
Corporate Tax Structure	-		(\$)	Tax Rate	(\$)	Tax Rate		
EBIT (\$)	\$23,000		80	15.0%	80	15.0%		
Taxes Paid (3-yr average)	\$2,333		\$50,000	16.7%	\$22,750	18.8%		
Marginal Income Tax Rates:			\$75,000	20.4%	\$55,100	24.8%		
Federal	15.0%		\$100,000	28.3%	\$115,000	29.5%		
State	%9.9		\$335,000	34.0%	\$250,000	37.8%		
Combined	21.6%							

Column 1	2		3	4	S	9	7	8	6
				Tax Shield				Adjusted	Cash Outflow
	Year Depreciation Depreciation	iation D	epreciation	From		O&M		Tax	After
		Rate	For Year	Depreciation	O&M Cost	Tax Shield	Cash Outflow	Shield	Tax Shields
	- 5	2 00%	85 000	\$1,080	\$10,500	\$2.268	\$110.500	\$2.333	\$108.167
	2 .	%05.6	\$9,500	\$2,052	\$1,000	\$216	\$1,000	\$2,268	(\$1,268)
	3	8.55%	\$8,550	\$1,847	\$1,000	\$216	\$1,000	\$2,063	(\$1,063)
	4 7.	7.70%	\$7,700	\$1,663	\$1,000	\$216	\$1,000	\$1,879	(628\$)
	5 6.	6.93%	\$6,930	\$1,497	\$1,000	\$216	\$1,000	\$1,713	(\$713)
	9 9	6.23%	\$6,230	\$1,346	\$1,000	\$216	\$1,000	\$1,562	(\$562)
	7 5.	2.90%	\$5,900	\$1,274	\$1,000	\$216	\$1,000	\$1,490	(\$490)
	8 5.	2.90%	\$5,900	\$1,274	\$1,000	\$216	\$1,000	\$1,490	(\$490)
	9 5.	5.91%	\$5,910	\$1,277	\$1,000	\$216	\$1,000	\$1,493	(\$493)
	10 5.	2.90%	\$5,900	\$1,274	\$1,000	\$216	\$1,000	\$1,490	(\$490)
	11 5.	5.91%	\$5,910	\$1,277	\$1,000	\$216	\$1,000	\$1,493	(\$493)
		2.90%	\$5,900	\$1,274	\$1,000	\$216	\$1,000	\$1,490	(\$490)
	13 5.	5.91%	\$5,910	\$1,277	\$1,000	\$216	\$1,000	\$1,493	(\$493)
	14 5.	2.90%	\$5,900	\$1,274	\$1,000	\$216	\$1,000	\$1,490	(\$490)
	15 5.	5.91%	\$5,910	\$1,277	\$1,000	\$216	\$1,000	\$1,493	(\$493)
	16 2.	2.95%	\$2,950	\$637	\$500	\$108	8500	\$745	(\$245)
	Sum 100.	%00.001	\$100,000	\$21,600	\$25,000	\$5,400	\$125,000		\$99,015
Present Value	Value		\$80,537	\$17,396	\$21,811	\$4,711	\$121,811		\$100,719
			A	After Tax Shield	Bet	Before Tax Shield			
Present Value of Incremental Costs:	:si			\$100,719		\$121,811			
Annualized Cost:				98,234		59,703			

Notes: This spreadsheet assumes that a modified accelerated cost recovery system (MACRS) is used to depreciate capital expenditures. Depreciation rates are from 1995 U.S. Master Tax Guide for 15-year property and mid-year convention. Corporate Tax Structure: 1= corporate tax rate 2 = individual tax rate 3 = S or Limited Liability corporations. If the company-specific discount rate is <3% or >19%, then an industry median figure of ___% is used. First Year is not discounted.

A-10

= \$500) for a total of \$10,500. Year 1 and Year 16 show only six months of O&M expenses because of the mid-year convention assumption for depreciation. For Years 2 through 15, O&M is a constant amount. Column 6 is the potential tax shield or benefit provided from expensing the O&M costs.

Column 7 lists a site's annual pre-tax cash outflow or total expenses associated with the additional pollution control equipment. Total expenses include capital costs, assumed to be incurred during the first year when the equipment is installed, any one-time non-equipment cost, plus each year's O&M expense.

Column 8 is the adjusted tax shield. The potential tax shield is the sum of the tax shields from depreciation (Column 4) and O&M/one-time costs (Column 6). If the potential tax shield for any year exceeds the 3-year average taxes paid, the tax shield is limited to the average taxes paid by the company. In Table A-3 example, the potential tax shield in Year 1 is \$1,080 plus \$2,268 = \$3,348. The exceeds the average taxes paid over the last three years (\$2,333). Hence, the tax shield is limited to \$2,333. The limit is not invoked in any of the remaining years in the cost annualization model. This approach is conservative in that the limit is applied every year when a company may opt to carry losses forward to decrease tax liabilities in future years. An alternative approach is to limit the present value of the tax shield to the present value of taxes paid for the 15-year period. Should the first approach appear to overestimate cost impacts, the second approach may be examined as a sensitivity analysis.

Column 9 lists the annual cash outflow less the adjusted tax shield (Column 7 minus Column 8); a site will recover these costs in the form of reduced income taxes. The sum of the 16 years of after-tax expenses is \$125,000 (1997 dollars), i.e., the sum of the capital expense (\$1,000,000), the one-time expense (\$10,000) and 15 years of O&M (\$15,000). The present value of these payments is \$121,811 The present value calculation takes into account the time value of money and is calculated as:

Present Value of Cash Outflows '
$$\mathbf{j}_{i'1}^n = \frac{\text{cash outflow, year}_i}{(1 \% \text{ real discount rate})^{i\&1}}$$

The exponent in the denominator is i-1 because the real discount rate is not applied to the cash outflow in Year 1. The present value of the after-tax cash outflow is used in the closure analysis to calculate the post-regulatory present value of future earnings for a site.

The present value of the cash outflow is transformed into a constant annual payment for use as the annualized site compliance cost. The annualized cost is calculated as a 16-year annuity that has the same present value as the total cash outflow in Column 9. The annualized cost represents the annual payment required to finance the cash outflow after tax shields. In essence, paying the annualized cost each year and paying the amounts listed in Column 8 for each year are equivalent. The annualized cost is calculated as:

Annualized Cost ' Present value of cash outflows (
$$\frac{\text{real discount rate}}{1 \& (\text{real discount rate } \% \ 1)^{\&n}}$$

where n is the number of payment periods. In this example, based on the capital investment of \$100,000, a one-time expense of \$10,000, O&M costs of \$1,000 per year, a tax rate of 21.6 percent, and a nominal discount rate of 7 percent, the site's annualized cost is \$9,983 on a pre-tax basis and \$8,254 on a post-tax basis.¹

The pre-tax annualized cost is used in calculating the cost of the regulation. It incorporates the cost to industry for the purchase, installation, and operation of additional pollution control equipment as well as the cost to federal and state government from lost tax revenues. (Every tax dollar that a business does not pay due to a tax shield is a tax dollar lost to the government.) Post-tax annualized costs are used to shock the market model because they reflect the cost to industry.

A.4 REFERENCES

Brigham. 1997. Brigham, Eugene, F and Louis C. Gapenski. Financial management: theory and practice. 8th edition. Chicago, IL: The Dryden Press.

CEA. 1999. Council of Economic Advisors. Economic report of the president. Washington, DC. Tables B-60 and B-73.

CCH. 1999a. Commerce Clearing House, Inc. 2000 State tax handbook. Chicago, IL.

CCH. 1999b. Commerce Clearing House, Inc. 2000 U.S. master tax guide. Chicago, IL.

¹ Note that post-tax annualized cost can be calculated in two ways. The first way is to calculate the annualized cost as the difference between the annuity value of the cash flows (Column 7) and the adjusted tax shield (Column 8). The second way is to calculate the annuity value of the cash flows after tax shields (Column 9). Both methods yield the same result.

- ENR. 2000. Engineering News Record. Construction cost index.
- OMB. 1992. Guidelines and discount rates for benefit-cost analysis of federal programs. Appendix A. Revised circular No. A-94. October 29. Washington, DC: Office of Management and Budget.
- RIA. 1999. The Research Institute of America, Inc. The complete internal revenue code. New York, NY. July 1999 edition.
- U.S. EPA. 1998. Collection of 1997 iron and steel industry data. OMB No. 2040-0193. Washington, DC: U.S. Environmental Protection Agency, Office of Water.

		Cross-reference	2001100111111100	una sie edaes		
1997 NAICS code	1997 NAICS industry description	New, Existing or Revised Industry	Proposed size standard (\$ million or emp #) for NAICS industry	Existing size standard (\$ million or emp #) for SIC activity	1987 SIC code (* = part of SIC code)	1987 SIC industry
		Secto	or 21 Mining			
		Subsector 212	Mining (except Oil	and Gas)		
212111	Bituminous Coal and Lignite Surface Mining	E	500	500	1221	Bituminous Coal and Lignite Surface Mining
21221	Iron Ore Mining	Е	500	500	1011	Iron Ores
		Secto	or 22 Utilities			
		Subsect	or 221 Utilities	s		
22121	Natural Gas Distribution	R	500	\$5.0	*4923	Natural Gas Transmission and Distribution (distribution)
				500	4924	Natural Gas Distribution
				\$5.0	4925	Mixed, Manufactured, or Liquefied Petroleum Gas Production and/or Distribution (natural gas distribution)
				\$5.0	*4931	Electronic and Other Services Combined (natural gas distribution)
				\$5.0	4932	Gas and Other Services combined (natural gas distribution)
				\$5.0	*4939	Combination Utilities, NEC (natural gas distribution)

1997 NAICS code		r 233 Building,		General Contra	_	1987 SIC industry
23321	Single Family Housing Construction	R	\$17.0	\$17.0 \$17.0	*1531	General contractors-Single- Family Houses Operative Builders (single-
	Subsecto	or 324 Petroleun	and Coal Produ	uets Manufactu	ring	family housing construction)
32411	Petroleum Refineries	E	\4\ 1,500	\4\ 1,500	2911	Petroleum Refining
324199	All Other Petroleum and Coal Products Manufacturing	R	500	500	2999	Products of Petroleum and Coal, NEC
				1,000	*3312	Blast Furnaces and Steel Mils (coke ovens)
	_	Subsector 325	Chemical Manufacturi	ing		
32511	Petrochemical Manufacturing	N	1,000	750	*2865	Cyclic Organic Crudes and Intermediates, and Organic Dyes and Pigments (aromatics)
				1,000	*2869	Industrial Organic Chemicals, NEC (aliphatics)
25132	Synthetic Organic Dye and Pigment Manufacturing	N	750	750	*2865	Cyclic Organic Crudes and Intermediates, and Organic Dyes and Pigments (organic dyes and pigments)
	S	ubsector 331 Pr	imary Metal Ma	nufacturing		
331111	Iron and Steel Mills	N	1,000	1,000	*3312	Steel Works, Blast Furnaces (Including Coke Ovens), and Rolling Mills (except coke ovens not integrated with steel mills)
				750	*3399	Primary Metal Products, NEC (ferrous powder, paste, flakes, etc.)
33121	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel	Е	1,000	1,000	3317	Steel Pipe and Tubes
331221	Cold-Rolled Steel Shape Manufacturing	Е	1,000	1,000	3316	Cold-Rolled Steel Sheet, Strip and Bars

1997 NAICS code	1997 NAICS industry description	New, Existing or Revised Industry	Proposed size standard (\$ million or emp #) for NAICS industry	Existing size standard (\$ million or emp #) for SIC activity	1987 SIC code (* = part of SIC code)	1987 SIC industry
331222	Steel Wire Drawing	R	1,000	1,000	*3315	Steel Wiredrawing and Steel Nails and Spikes (steel wire drawing)
331421	Copper Rolling, Drawing and Extruding	Е	750	750	3351	Rolling, Drawing, and Extruding of Copper
331491	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing and Extruding	R	750	750	3356	Rolling, Drawing and Extruding of Nonferrous Metals, Except Copper and Aluminum
331492	Secondary Smelting, Refining, and Allying of Nonferrous Metal (except Copper and Aluminum)	N	750	750	*3313	Electrometallurgical Products, Except Steel (except copper and aluminum)
				500	*3341	Secondary Smelting and Reining of Nonferrous Metals (except copper and aluminum)
				750	*3399	Primary Metal Products, NEC (except copper and aluminum)
331511	Iron Foundries	R	500	500	3321	Gray and Ductile Iron Foundries
				500	3322	Malleable Iron Foundries
331512	Steel Investment Foundries	E	500	500	3324	Steel Investment Foundries
331513	Steel Foundries, (except Investment)	Е	500	500	3325	Steel Foundries, NEC
	Subsec	tor 332 - Fabricat	ed Metal Produc	ct Manufacturir	ng	
332117	Powder Metallurgy Part Manufacturing	N	500	500	*3499	Fabricated Metal Products, NEC (powder)

1997 NAICS code	1997 NAICS industry description	New, Existing or Revised Industry	Proposed size standard (\$ million or emp #) for NAICS industry	Existing size standard (\$ million or emp #) for SIC activity	1987 SIC code (* = part of SIC code)	1987 SIC industry
332439	Other Metal Container Manufacturing	R	500	500	3412	Metal Shipping Barrels, Drums, Kegs, and Pails
				500	*3429	Hardware, NEC (vacuum and insulated bottles, jugs, and chests)
				500	*3444	Sheet Metal Work (metal bins and vats)
				500	*3499	Fabricated Metal Products, NEC (metal boxes)
				750	*3537	Industrial Trucks, Tractors, Trailers, and Stackers (metal air cargo containers)
33251	Hardware Manufacturing	R	500	500	*3429	Hardware, NEC (hardware, except hose nozzles, and vacuum and insulated bottles, jugs and chests)
				500	*3499	Fabricated Metal Products, NEC (safe and vault locks)
332618	Other Fabricated Wire Product Manufacturing	R	500	1,000	*3315	Steel Wiredrawing and Steel Nails and Spikes (nails, spikes, paper clips and wire not made in wiredrawing plants)
				750	*3399	Primary Metal Products, NEC (nonferrous nails, brads, staples, etc.)
				500	3496	Miscellaneous Fabricated Wire Products
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers	R	500	500	*3479	Coating, Engraving, and Allied Services, NEC (except jewelry, silverware, and flatware engraving and etching)
332813	Electroplating, Plating, Polishing, Anodizing and Coloring	R	500	750	*3399	Primary Metal Products, NEC (laminating steel)
				500	3471	Electroplating, Plating, Polishing, Anodizing, and Coloring
332991	Ball and Roller Bearing Manufacturing	Е	750	750	3562	Ball and Roller Bearings

1007 NAVOS	1997 NAICS industry	New, Existing or Revised	Proposed size standard (\$ million or emp #) for NAICS industry	Existing size standard (\$ million or emp #) for SIC activity	1987 SIC code (* = part of	1987 SIC
1997 NAICS code	description	Industry Subsector 333 1	Machinery Man	ufacturing	SIC code)	industry
333319	Other Commercial and Service Industry Machinery Manufacturing	R	500	500	*3559	Special Industry Machinery, NEC (automotive maintenance equipment)
				500	3589	Service Industry Machinery, NEC
				500	*3599	Industrial and Commercial Machinery and Equipment, NEC (carnival amusement park equipment)
				750	*3699	Electrical Machinery, Equipment and Supplies, NEC (electronic teaching machines and flight simulators)
333618	Other Engine Equipment Manufacturing	R	1,000	1,000	*3519	Internal Combustion Engines, NEC (except stationary engine radiators)
				750	*3699	Electrical Machinery, Equipment and Supplies, NEC (outboard electric motors)
	Subsector :	334 Computer a	nd Electronic Pr	oduct Manufac	turing	
334413	Semiconductor and Related Device	Е	500	500	3674	Semiconductors and Related Devices
	S	Subsector 339 M	iscellaneous Ma	nufacturing		
339911	Jewelry (except Costume) Manufacturing	R	500	500	*3469	Metal Stamping, NEC (stamping coins)
				500	*3479	Coating, Engraving, and Allied Services, NEC (jewelry engraving and etching, including precious metal)

1997 NAICS code	1997 NAICS industry description	New, Existing or Revised Industry	Proposed size standard (\$ million or emp #) for NAICS industry	Existing size standard (\$ million or emp #) for SIC activity	1987 SIC code (* = part of SIC code)	1987 SIC industry
		Sector 42	- Wholesale Tra	de		
	Su	bsector 421 Wh	olesale Trade, D	urable Goods		
42151	Metal Service Centers and Offices	E	100	100	5051	Metals Service Centers and Offices
42193	Recyclable Material Wholesalers	E	100	100	5093	Scrap and Waste Materials
	Subs	sector 422 Whol	esale Trade, Non	durable Goods		
42251	Grain and Field Bean Wholesalers	E	100	100	5153	Grain and Field Beans
	Sector	r 55 Manageme	nt of Companies	and Enterprise	s	
	Subsecto	or 551 Managen	nent of Compani	es and Enterpr	ises	
551111	Offices of Bank Holding Companies	Е	\$5.0	\$5.0	6712	Offices of Bank Holding Companies
551112	Offices of Other Holding Companies	Е	\$5.0	\$5.0	6719	Offices of Holding Companies, NEC

Source: Federal Register, 22 October 1999

APPENDIX C

COST-EFFECTIVENESS ANALYSIS

C.1 INTRODUCTION

This cost-effectiveness (CE) analysis presents an evaluation of the technical efficiency of pollutant control options for the proposed effluent limitations guidelines and standards for the iron and steel manufacturing point source category based on Best Available Technology Economically Achievable (BAT) and Pretreatment Standards for Existing Sources (PSES). BAT standards set effluent limitations on toxic and nonconventional pollutants for direct dischargers prior to wastewater discharge directly into a water body such as a stream, river, lake, estuary, or ocean. Indirect dischargers send wastewater to publicly owned treatment works (POTW) for further treatment prior to discharge to U.S. surface waters; PSES set limitations for indirect dischargers on toxic and nonconventional pollutants which pass through a POTW.

Section C.2 discusses EPA's cost-effectiveness methodology and identifies the pollutants included in the analysis. This section also presents EPA's toxic weighting factors for each pollutant and discusses POTW removal factors for indirect dischargers. Section C.3 presents the cost-effectiveness analysis. Section C.4 contains supplementary data tables while Section C.5 lists references.

C.2 COST-EFFECTIVENESS METHODOLOGY

C.2.1 Overview

Cost-effectiveness is evaluated as the incremental annualized cost of a pollution control option in an industry or industry subcategory per incremental pound equivalent of pollutant (i.e., pound of pollutant adjusted for toxicity) removed by that control option. EPA uses the cost-effectiveness analysis primarily to compare the removal efficiencies of regulatory options under consideration for a rule. A secondary and less effective use is to compare the cost-effectiveness of the proposed options for the iron and steel manufacturing industry to those for effluent limitation guidelines and standards for other industries.

To develop a cost-effectiveness study, the following steps must be taken to define the analysis or generate data used for calculating values:

- # Determine the pollutants effectively removed from the wastewater.
- # For each pollutant, identify the toxic weights and POTW removal factors. (The first adjusts the removals to reflect the relative toxicity of the pollutants while the second reflects the ability of a POTW or sewage treatment plant to remove pollutants prior to discharge to the water. These are described in Sections C.2.2 and C.2.3.)
- # Define the regulatory pollution control options.
- # Calculate pollutant removals for each pollution control option.
- # Calculate the product of the pollutant removed (in pounds), the toxic weighting factor, and the POTW removal factor. The resultant removal is specified in terms of "pound-equivalents" removed.
- # Determine the annualized cost of each pollution control option.
- # Rank the pollution control options in order of increasing pound equivalents removed.
- # Identify and delete from consideration ineffective options.
- # Calculate incremental CE for remaining options.

Table C-1 presents the pollutants, their toxic weights, and POTW removal factors used in the CE calculations.

C.2.2 Toxic Weighting Factors

Cost-effectiveness analyses account for differences in toxicity among the pollutants using toxic weighting factors. Accounting for these differences is necessary because the potentially harmful effects on human and aquatic life are specific to the pollutant. For example, a pound of zinc in an effluent stream has a significantly different, less harmful effect than a pound of PCBs. Toxic weighting factors for pollutants are derived using ambient water quality criteria and toxicity values. For most industries, toxic weighting factors are developed from chronic freshwater aquatic criteria. In cases where a human health criterion has also been established for the consumption of fish, the sum of both the human and aquatic criteria are used

 $\label{eq:c-1} \textbf{Toxic Weighting Factors and POTW Removal Factors for Pollutants}$

	Toxic	POTW
Pollutant Name	Weighting Factor	Removal Factor
1,2,3,4,6,7,8-Heptachlorodibenzofuran	6.70E+05	0%
1,2,3,4,7,8-Hexachlorodibenzofuran	6.70E+06	0%
1,2,3,6,7,8-Hexachlorodibenzofuran	6.70E+06	0%
1,2,3,7,8-Pentachlorodibenzofuran	3.30E+06	0%
2-Methylnaphthalene	8.00E-02	28%
2-Phenylnaphthalene	1.50E-01	85%
2,3,4,6,7,8-Hexachlorodibenzofuran	6.70E+06	0%
2,3,4,7,8-Pentachlorodibenzofuran	3.30E+07	0%
2,3,7,8-Tetrachlorodibenzofuran	6.70E+06	0%
2,4-Dimethylphenol	5.30E-03	51%
4-Nitrophenol	9.40E-03	0%
Acetone	5.00E-06	95%
alpha-Terpineol	1.10E-03	94%
Aluminum	6.40E-02	91%
Ammonia As Nitrogen (NH3-N)	1.80E-03	39%
Aniline	1.40E+00	93%
Antimony	4.80E-03	67%
Arsenic	3.50E+00	66%
Barium Benzene	2.00E-03	55% 05%
Benzo(a)anthracene	1.80E-02 1.80E+02	95% 98%
Benzo(a)antnracene Benzo(a)pyrene	1.80E+02 4.30E+03	98% 95%
Benzo(b)fluoranthene	4.30E+03 4.20E+02	93%
Benzo(k)fluoranthene	4.20E+01	93%
Bis(2-ethylhexyl) Phthalate	4.20E+01	93%
Boron	1.80E-01	24%
Cadmium	2.60E+00	90%
Chromium	7.60E-02	80%
Chromium, Hexavalent	5.10E-01	6%
Chrysene	2.10E+00	97%
Cobalt	1.10E-01	10%
Copper	6.30E-01	84%
Dibenzofuran	2.00E-01	98%
Fluoranthene	7.00E-01	42%
Fluoride	3.50E-02	54%
Hexanoic Acid	3.70E-04	84%
Iron	5.60E-03	82%
Lead	2.20E+00	77%
Magnesium	8.70E-04	14%
Manganese	7.00E-02	36%
Mercury	1.20E+02	90%
Molybdenum Naphthalene	2.00E-01	19% 95%
Naphthalene n-Decane	1.50E-02	95% 9%
n-Decane n-Dodecane	4.30E-03	
n-Dodecane n-Eicosane	4.30E-03 4.30E-03	95% 92%
n-Eicosane n-Hexadecane	4.30E-03 4.30E-03	92% 71%
Nickel	4.50E-05 1.10E-01	51%
Nitrate/Nitrite (NO2 + NO3-N)	6.20E-05	90%
n-Octadecane	4.30E-03	71%
o-Cresol	2.70E-03	53%
o-Clesor o-Toluidine	1.30E-01	84%
p-Cresol	4.00E-03	72%
Phenanthrene	2.90E-01	95%
Phenol	2.80E-02	95%
Pyrene	1.10E-01	84%
Pyridine	1.30E-03	95%
Selenium	1.10E+00	34%
Silica Gel Treated-HEM (SGT-HEM)		87%
Silver	1.60E+01	88%
Thallium	1.00E+00	50%
Thiocyanate		70%
Tin	3.00E-01	43%
Titanium	2.90E-02	92%
Total Cyanide	1.10E+00	70%
Vanadium	6.20E-01	8%
Zinc	4.70E-02	79%

to derive toxic weighting factors. The factors are standardized by relating them to a "benchmark" toxicity value, which was based on the toxicity of copper when the methodology was developed.¹

Examples of the effects of different aquatic and human health criteria on freshwater toxic weighting factors are presented in Table C-2. As shown in this table, the toxic weighting factor is the sum of two criteria-weighted ratios: the former benchmark copper criterion divided by the human health criterion for the particular pollutant and the former benchmark copper criterion divided by the aquatic chronic criterion. For example, using the values reported in Table C-2, four pounds of the benchmark chemical (copper) pose the same relative hazard in freshwater as one pound of cadmium because cadmium has a freshwater toxic weight four times greater than the toxic weight of copper (2.6 divided by 0.63 equals 4.13).

C.2.3 POTW Removal Factors

Calculating pound equivalents for direct dischargers differs from calculating for indirect dischargers because of the ability of POTWs to remove certain pollutants. The POTW removal factors are used as follows: If a facility is discharging 100 pounds of chromium in its effluent stream to a POTW and the POTW has a 80 percent removal efficiency for chromium, then the chromium discharged to surface waters is only 20 pounds (1 minus 0.8 equals 0.2). If the regulation reduces chromium discharged in the effluent stream to the POTW by 50 pounds, then the amount discharged to surface waters is calculated as 50 pounds multiplied by the POTW removal factor (50 pounds times 0.2 equals 10 pounds). The cost-effectiveness calculations then reflect the fact that the actual reduction of pollutant discharged to surface water is not 50 pounds (the change in the amount discharged to the POTW), but 10 pounds (the change in the amount actually discharged to surface water). A pollutant discharge that is unaffected by the POTW has a removal factor of 1.

 $^{^{1}}$ Although the water quality criterion has been revised (to 9.0 µg/l), all cost-effectiveness analyses for effluent guideline regulations continue to use the former criterion of 5.6 µg/l as a benchmark so that cost-effectiveness values can continue to be compared to those for other effluent guidelines. Where copper is present in the effluent, the revised higher criterion for copper results in a toxic weighting factor for copper of 0.63 rather than 1.0.

TABLE C-2

EXAMPLES OF TOXIC WEIGHTING FACTORS BASED ON COPPER FRESHWATER CHRONIC CRITERIA

Pollutant	Human Health Criteria (µg/l)	Aquatic Chronic Criteria (µg/l)	Weighting Calculation	Toxic Weighting Factor
Copper*	1,200	9.0	5.6/1,200 + 5.6/9.0	0.63
Cadmium	84	2.2	5.6/84 + 5.6/2.2	2.6
Naphthalene	21,000	370	5.6/21,000 + 5.6/370	0.015

^{*} The water quality criterion has been revised (to 9.0 μ g/l). Formerly, the weighting factor calculation led to a result of 0.47 as a toxic weighting factor for copper.

Notes: Human health and aquatic chronic criteria are maximum contamination thresholds. Units for criteria are micrograms of pollutant per liter of water.

C.2.4 Pollutant Removals And Pound-equivalent Calculations

The pollutant loadings have been calculated for each facility under each regulatory pollution control option for comparison with baseline (i.e., current practice) loadings. Pollutant removals are calculated simply as the difference between current and post-treatment discharges. These pollutant removals are converted into pound equivalents for the cost-effectiveness analysis. For direct dischargers, removals in pound equivalents are calculated as:

For indirect dischargers, removals in pound equivalents are calculated as:

Total removals for each option are then calculated by adding up the removals of all pollutants included in the cost-effectiveness analysis for a given subcategory.

C.2.5 Calculation Of Incremental Cost-effectiveness Values

Cost-effectiveness ratios are calculated separately for direct and indirect dischargers and by subcategory. Within each of these many groupings, the pollution control options are ranked in ascending order of pound equivalents removed. The incremental cost-effectiveness value for a particular control option is calculated as the ratio of the incremental annual cost to the incremental pound equivalents removed. The incremental effectiveness may be viewed primarily in comparison to the baseline scenario and to other regulatory pollution control options. Cost-effectiveness values are reported in units of dollars per pound equivalent of pollutant removed.

For the purpose of comparing cost-effectiveness values of options under review to those of other promulgated rules, compliance costs used in the cost-effectiveness analysis are adjusted to 1981 dollars using

Engineering News Record's Construction Cost Index (CCI), see ENR 2000. The adjustment factor is calculated as follows:

The equation used to calculate incremental cost-effectiveness is:

$$CE_k' = \frac{ATC_k \& ATC_{k\&1}}{PE_k \& PE_{k\&1}}$$

where:

 CE_k = Cost-effectiveness of Option k

 ATC_k = Total annualized treatment cost under Option k

PE_k= Pound equivalents removed by Option k

Cost-effectiveness measures the incremental unit cost of pollutant removal of Option k (in pound equivalents) in comparison to Option k-1. The numerator of the equation, ATC_k minus ATC_{k-1} , is simply the incremental annualized treatment cost in moving from Option k-1 (an option that removes fewer pound equivalents of pollutants) to Option k (an option that removes more pound equivalents of pollutants). Similarly, the denominator is the incremental removals achieved in going from Option k-1 to k.

C.3 COST-EFFECTIVENESS ANALYSIS

Chapter 5 presents the options and costs for each of the subcategories. Pre-tax annualized costs are used in the CE calculations. Section C.4 contains the supplementary pound and pound-equivalent tables for the analysis. The total pounds removed in these tables may differ from those presented in the Technical Development Document because the costs and removals for sites projected to close prior to the implementation of the rule have been deleted from the analysis. For a site which is projected to close as a result of the rule, the compliance costs are included but the removals are the entire discharge of the site.

C.3.1 Subcategory Cost-effectiveness

Table C-3 shows the incremental CE tables for direct (BAT) and indirect (PSES) dischargers in all subcategories that regulate toxic and nonconventional pollutants. That is, the "other operations" subcategory considers the removal of only conventional pollutants and is not included in Table C-3. For BAT cokemaking, the cost ranges from \$10 to \$38,300 per pound-equivalent. For PSES cokemaking, the CE ranges from \$39 to \$729 per pound-equivalent. The non-integrated steelmaking and hot-forming operations for direct discharging stainless steel processors is the only other segment or category with more than one option. In this case, the CE ranges from \$35 to \$439,945 per pound-equivalent. All other subcategories have one BAT and one PSES option.

C.3.2 Industry Cost-effectiveness

Tables C-4, C-5a, and C-5b list the incremental annualized cost and the incremental removals for the proposed options for each subcategory. The incremental values are totals to provide the industry cost-effectiveness ratios. Table C-5 has two parts because EPA is co-proposing two options for PSES cokemaking. Table C-5a shows industry cost-effectiveness with cokemaking PSES 1 while the Table C-5b shows industry cost-effectiveness with cokemaking PSES 3. For BAT, the industry CE ratio is \$66 per pound-equivalent. For PSES, the industry CE ratio ranges from \$40 to \$53 per pound-equivalent. Tables C-6 and C-7 summarize the cost-effectiveness of the proposed options for the iron and steel manufacturing industry relative to that of other industries for direct and indirect dischargers, respectively.

C.4 SUPPLEMENTAL TABLES

Tables C-8 to C-15 present pollutant removals for all options for direct dischargers. Tables C-16 through C-23 show pollutant removals for indirect dischargers. Baseline loads for each subcategory are illustrated in Tables C-24 through C-39. All tables in this section present pounds removed and pound equivalents removed.

C.5 REFERENCES

Engineering News Record. 2000. Construction cost index history, 1907-2000. Engineering News Record. March 27.

Table C-3

Results of Cost-Effectiveness Analyses by Subcategory

Subcategory	Segment	Regulatory Option	Pre-Tax Annualized Costs (Millions of \$1997)	Pollutant Removals (Pound Equivalents)	Pre-Tax Incremental Cost- Effectiveness (\$1981 Per Pound-Equivalent Removed)
Cokemaking		BAT 1	\$0.93	\$0.93 56,329	
		BAT 2	\$4.21	71,192	\$134
		BAT 3	\$8.56	147,546	\$35
		BAT 4	\$15.22	147,648	\$38,300
		PSES 1	\$0.29	3,398	\$52
		PSES 2	\$2.22	5,614	\$527
		PSES 3	\$4.98	48,511	\$39
		PSES 4	\$8.50	51,441	\$729
Ironmaking		BAT 1	\$5.19 61,883		\$51
		PSES 1	\$0.17	1,168	\$90
Integrated Steelmaking		BAT 1	\$4.85	102,645	\$29
		PSES 1	\$0	0	\$0
Integrated and		BAT 1	\$27.47	87,200	\$191
Stand-Alone Hot- Forming	Carbon	PSES 1	\$0.08	148	\$319
	Stainless	PSES 1	\$0.23	11	\$12,041
Non-Integrated	Carbon	BAT 1	\$3.98	39,092	\$62
Steelmaking and Hot- Forming	Stainless	BAT 1	\$0.11	1,873	\$35
		BAT 2	\$0.87	1,874	\$439,945
	Carbon	PSES 1	\$0.64	42	\$9,124
	Stainless	PSES 1	\$0.03	1,779	\$11
Steel Finishing	Carbon	BAT 1	\$3.43	16,563	\$126
	Stainless	BAT 1	\$0.20	69,732	\$2
	Carbon	PSES 1	\$1.80	372	\$2,929
	Stainless	PSES 1	\$0.56	650	\$525

Table C-4

Incremental Cost-Effectiveness of Pollutant Control Options
Iron and Steel Manufacturing Point Source Category
Direct Dischargers

		Incremental					
Subcategory	Segment	Pre-Tax Annualized Cost (Millions of \$1997)	Pound Equivalents Removed	Cost-Effectiveness (\$1981/Pound Equivalents)			
Cokemaking		\$4.35	76,354	\$35			
Ironmaking		\$5.19	61,883	\$51			
Integrated Steelmaking		\$4.85	102,641	\$29			
Integrated Steelmaking	Carbon	\$27.47	87,200	\$191			
and Hot-Forming	Stainless	\$0	0	No Regulation			
Non-Integrated	Carbon	\$3.98	39,092	\$62			
	Stainless	\$0.11	1,873	\$35			
Steel Finishing	Carbon	\$3.43 16,563		\$126			
	Stainless	\$0.20	69,732	\$2			
Industry Total		\$49.58	455,338	\$66.08			

Table C-5a

Incremental Cost-Effectiveness of Pollutant Control Options
Iron and Steel Manufacturing Point Source Category
Indirect Dischargers- Cost Combination A

			Incremental				
Subcategory	Segment	Pre-Tax Annualized Cost (Millions of \$1997)	Pound Equivalents Removed	Cost-Effectiveness (\$1981/Pound Equivalents)			
Cokemaking		\$0.29	3,398 \$5				
Ironmaking		\$0.17	1,168	\$90			
Integrated Steelmaking	itegrated Steelmaking		0	No Regulation			
Integrated Steelmaking	Carbon	\$0.08	148	\$319			
and Hot-Forming	Stainless	\$0	0	No Regulation			
Non-Integrated	Carbon	\$0	0	No Regulation			
	Stainless	\$0.03	1,779	\$11			
Steel Finishing	Carbon	\$0	0	No Regulation			
	Stainless	\$0	0	No Regulation			
Industry Total		\$0.57	6,493	\$53.27			

Table C-5b

Incremental Cost-Effectiveness of Pollutant Control Options
Iron and Steel Manufacturing Point Source Category
Indirect Dischargers- Cost Combination B

		Incremental					
Subcategory	Segment	Pre-Tax Annualized Cost (Millions of \$1997)	Pound Equivalents Removed	Cost-Effectiveness (\$/1981 Pound Equivalents)			
Cokemaking		\$2.76	42,897	\$39			
Ironmaking		\$0.17	1,168	\$90			
Integrated Steelmaking		\$0	0	No Regulation			
Integrated Steelmaking	Carbon	\$0.08	148	\$319			
and Hot-Forming	Stainless	\$0	0	No Regulation			
Non-Integrated	Carbon	\$0	0	No Regulation			
	Stainless	\$0.03	1,779	\$11			
Steel Finishing	Carbon	\$0	0	No Regulation			
	Stainless	\$0	0	No Regulation			
Industry Total		\$3.04	45,992	\$40.11			

TABLE C-6 INDUSTRY COMPARISON OF BAT COST-EFFECTIVENESS FOR DIRECT DISCHARGERS

(Toxic and Nonconventional Pollutants Only; Copper-Based Weights^a; \$ 1981)

Industry	Pound Equivalents Currently Discharged (thousands)	Pound Equivalents Remaining at Selected Option (thousands)	Cost-Effectiveness of Selected Option(s) (\$/ Pound Equivalents removed)
Aluminum Forming	1,340	90	121
Battery Manufacturing	4,126	5	2
Canmaking	12	0.2	10
Centralized Waste Treatment ^c	3,372	1,261-1,267	5-7
Coal Mining	BAT=BPT	BAT=BPT	BAT=BPT
Coil Coating	2,289	9	49
Copper Forming	70	8	27
Electronics I	9	3	404
Electronics II	NA	NA	NA
Foundries	2,308	39	84
Inorganic Chemicals I	32,503	1,290	<1
Inorganic Chemicals II	605	27	6
Iron & Steel	1,740	1,214	66
Leather Tanning	259	112	BAT=BPT
Metal Finishing	3,305	3,268	12
Metal Products and Machinery ^c	140	70	50
Nonferrous Metals Forming	34	2	69
Nonferrous Metals Mfg I	6,653	313	4
Nonferrous Metals Mfg II	1,004	12	6
Oil and Gas: Offshore ^b Coastal—Produced Water/TWC Drilling Waste	3,809 951 BAT = Current Practice	2,328 239 BAT = Current Practice	33 35 BAT = Current Practice
Organic Chemicals	54,225	9,735	5
Pesticides	2,461	371	14
Pharmaceuticals ^c A/C B/D	897 90	47 0.5	47 96
Plastics Molding & Forming	44	41	BAT=BPT
Porcelain Enameling	1,086	63	6
Petroleum Refining	BAT=BPT	BAT=BPT	BAT=BPT
Pulp & Paper ^c	61,713	2,628	39
Textile Mills	BAT=BPT	BAT=BPT	BAT=BPT
TEC: TB/CHEM&PETR TT & RT/CHEM&PETR	BAT=BPT 1	BAT=BPT ND	BAT=BPT 323

^{*}Although toxic weighting factors for priority pollutants varied across these rules, this table reflects the cost-effectiveness at the time of regulation.

^bProduced water only; for produced sand and drilling fluids and drill cuttings, BAT=NSPS.

ND: Nondisclosed due to business confidentiality.

TABLE C-7

INDUSTRY COMPARISON OF PSES COST-EFFECTIVENESS FOR INDIRECT DISCHARGERS

(Toxic and Nonconventional Pollutants Only; Copper-Based Wei-ghtsa; \$ 1981)

Industry ^b	Pound Equivalents Currently Discharged (To Surface Waters) (thousands)	Pound Equivalents Discharged at Selected Option (To Surface Waters) (thousands)	Cost-Effectiveness of Selected Option(s) Beyond BPT (\$/Pound Equivalents removed)
Aluminum Forming	1,602	18	155
Battery Manufacturing	1,152	5	15
Canmaking	252	5	38
Centralized Waste Treatment ^c	689	328-330	70-110
Coal Mining	NA	NA	NA°
Coil Coating	2,503	10	10
Copper Forming	934	4	10
Electronics I	75	35	14
Electronics II	260	24	14
Foundries	2,136	18	116
Inorganic Chemicals I	3,971	3,004	9
Inorganic Chemicals II	4,760	6	<1
Iron & Steel	74	22-68	40-53
Leather Tanning	16,830	1,899	111
Metal Finishing	11,680	755	10
Metal Products and Machinery ^c	1,115	234	127
Nonferrous Metals Forming	189	5	90
Nonferrous Metals Mfg I	3,187	19	15
Nonferrous Metals Mfg II	38	0.41	12
Organic Chemicals	5,210	72	34
Pesticide Manufacturing	257	19	18
Pesticide Formulating	7,746	112	<3
Pharmaceuticals ^c	340	63	1
Plastics Molding & Forming	NA	NA	NA
Porcelain Enameling	1,565	96	14
Pulp & Paper ^c	9,539	103	65
Transportation Equipment Cleaning	81	43	148

^aAlthough toxic weighting factors for priority pollutants varied across these rules, this table reflects the cost-effectiveness at the time of regulation.

^bNo known indirect dischargers at this time for offshore oil and gas and coastal oil and gas.

[°]Proposed.

Table C-8

Pollutant Removals

Cokemaking Subcategory

Direct Dischargers

						Pound Equivalents (PE)			
		Pounds Re	emoved		Toxic		Remo	ved	
Chemical Name	Option 1	Option 2	Option 3	Option 4	Weighting Factor	Option 1	Option 2	Option 3	Option
2,4-Dimethylphenol	5.7	5.7	25.3	25.3	5.30E-03	0.0	0.0	0.1	0.
2-Methylnaphthalene	48.0	48.0	67.7	67.7	8.00E-02	3.8	3.8	5.4	5.
2-Phenylnaphthalene	6.2	6.2	11.5	11.5	1.50E-01	0.9	0.9	1.7	1.
Acetone	32.5	32.5	47.4	47.4	5.00E-06	0.0	0.0	0.0	0.0
Ammonia As Nitrogen (NH3-N)	335,516.6	335,516.6	356,626.8	356,626.8	1.80E-03	603.9	603.9	641.9	641.9
Aniline	6.9	6.9	12.3	12.3	1.40E+00	9.7	9.7	17.2	17.2
Arsenic	66.7	66.6	70.4	70.4	3.50E+00	233.3	233.2	246.5	246.5
Benzene	24.9	24.8	26.4	26.4	1.80E-02	0.4	0.4	0.5	0.5
Benzo(a)anthracene	5.7	5.7	25.3	25.3	1.80E+02	1,027.0	1,029.6	4,561.2	4,561.2
Benzo(a)pyrene	10.5	10.5	21.7	21.7	4.30E+03	45,263.3	45,279.0	93,267.0	93,267.0
Benzo(b)fluoranthene	3.1	3.1	22.3	22.3	4.20E+02	1,282.5	1,285.2	9,349.2	9,349.2
Benzo(k)fluoranthene	3.0	3.0	22.6	22.6	4.20E+01	125.2	125.6	949.6	949.6
Boron	190.8	190.8	455.6	455.6	1.80E-01	34.3	34.3	82.0	82.0
Chrysene	6.4	6.4	23.7	23.7	2.10E+00	13.5	13.5	49.7	49.7
Dibenzofuran	5.7	5.7	25.3	25.3	2.00E-01	1.1	1.1	5.1	5.
Fluoranthene	5.7	5.7	25.3	25.3	8.00E-02	0.5	0.5	2.0	2.0
Mercury	0.2	0.2	0.3	1.2	1.20E+02	20.8	21.6	40.8	142.8
n-Eicosane	5.7	5.7	11.1	11.1	4.30E-03	0.0	0.0	0.0	0.0
n-Octadecane	5.7	5.7	11.1	11.1	4.30E-03	0.0	0.0	0.0	0.0
Naphthalene	3.6	3.6	7.6	7.6	1.50E-02	0.1	0.1	0.1	0.1
Nitrate/Nitrite (NO2 + NO3-N)	11,697.6	11,697.6	102,525.4	102,525.4	6.20E-05	0.7	0.7	6.4	6.4
o-Cresol	9.3	9.3	17.4	17.4	2.70E-03	0.0	0.0	0.0	0.0
o-Toluidine	5.7	5.7	11.1	11.1	1.30E-01	0.7	0.7	1.4	1.4
p-Cresol	7.2	7.2	25.5	25.5	4.00E-03	0.0	0.0	0.1	0.1
Phenanthrene	5.7	5.7	25.3	25.3	2.90E-01	1.7	1.7	7.3	7.
Phenol	49.6	49.6	67.7	67.7	2.80E-02	1.4	1.4	1.9	1.9
Pyrene	5.7	5.7	25.3	25.3	1.10E-01	0.6	0.6	2.8	2.8
Pyridine	7.5	7.5	12.9	12.9	1.30E-03	0.0	0.0	0.0	0.0
Selenium	2,413.4	2,413.4	2,782.2	2,782.2	1.10E+00	2,654.8	2,654.8	3,060.4	3,060.4
Total Cyanide	4,589.2	18,081.0	32,040.9	32,040.9	1.10E+00	5,048.2	19,889.1	35,245.0	35,245.0
Total	354,745	368,237	495,073	495,074		56,329	71,192	147,546	147,64

Table C-9

Pollutant Removals
Ironmaking Subcategory
Direct Dischargers

_		Тохіс	Pound Equivalents (PE Removed
Chemical Name	Option 1	W e ighting Factor	Option 1
Chemical Name	Орион 1	racioi	Орион 1
1,2,3,4,6,7,8-Heptachlorodibenzofuran	3.4E-04	6.70E+05	227.1
1,2,3,4,7,8-Hexachlorodibenzofuran	2.4E-04	6.70E+06	1,574.5
1,2,3,6,7,8-Hexachlorodibenzofuran	2.0E-04	6.70E+06	1,340.0
1,2,3,7,8-Pentachlorodibenzofuran	2.3E-04	3.30E+06	772.2
2,3,4,6,7,8-Hexachlorodibenzofuran	1.5E-04	6.70E + 06	1,031.8
2,3,4,7,8-Pentachlorodibenzofuran	3.5E-04	3.30E+07	11,550.0
2,3,7,8-T e trach lorod ib en z o furan	2.6E-04	6.70E+06	1,755.4
2,4-D ime thy lphenol	53.6	5.30E-03	0.3
4-N itrophenol	625.9	9.40E-03	5.9
Aluminum	12,526.0	6.40E-02	801.7
Ammonia As Nitrogen (NH3-N)	206,747.8	1.80E-03	372.1
Arsenic	39.4	3.50E+00	137.8
Boron	53,455.3	1.80E-01	9,621.9
Cadmium	59.2	2.60E+00	153.8
Chromium	383.7	7.60E-02	29.2
Copper	444.1	6.30E-01	279.8
Fluoranthene	26.1	8.00E-01	20.9
Fluoride -	337,282.4	3.50E-02	11,804.9
Iron	75,407.3	5.60E-03	422.3
Lead	1,089.9	2.20E+00	2,397.7
Magnesium	2,619,788.3	8.70E-04	2,279.2
Manganese	81,347.5	7.00E-02	5,694.3
Mercury	0.8	1.20E+02	98.4
Molybdenum Nickel	1,816.2 937.8	2.00E-01	363.2 103.2
N itrate/Nitrite (NO2 + NO3-N)	5,802.8	1.10E-01 6.20E-05	0.4
o-Cresol	24.6	2.70E-03	0.1
p-Cresol	30.1	4.00E-03	0.1
Phenanthrene	35.4	2.90E-01	10.3
Phenol	0.0	2.80E-02	0.0
Pyridine	307.1	1.30E-03	0.4
Se le n iu m	277.2	1.10E+00	304.9
T h a lliu m	1,283.1	1.00E+00	1,283.1
T h io c y a n a te	377.3	0.00E+00	0.0
T itanium	191.8	2.90E-02	5.6
Total Cyanide	6,250.2	1.10E+00	6,875.2
Zinc	12,023.7	4.70E-02	565.1
T o ta l	3,418,634		61,883

Table C-10

Pollutant Removals
Steelmaking Subcategory
Direct Dischargers

	Pounds		Pound Equivalents (PE
	Removed	Toxic	Removed
		Weighting	
Che mical Name	Option 1	Factor	Option 1
Aluminum	100,695.6	6.40E-02	6,444.5
Ammonia As Nitrogen (NH3-N)	0.0	1.80E-03	0.0
Antimony	3,703.7	4.80E-03	17.8
Cadmium	471.8	2.60E+00	1,226.6
Chromium	889.0	7.60E-02	67.6
Cobalt	880.3	1.10E-01	96.8
Copper	1,630.6	6.30E-01	1,027.3
Fluoride	1,479,924.0	3.50E-02	51,797.3
Iron	542,707.4	5.60E-03	3,039.2
Lead	6,077.9	2.20E+00	13,371.5
Magnesium	1,741,535.5	8.70E-04	1,515.1
Manganese	27,949.0	7.00E-02	1,956.4
Mercury	17.6	1.20E+02	2,114.8
Molybdenum	33,624.5	2.00E-01	6,724.9
Nitrate/Nitrite (NO2 + NO3-N)	0.0	6.20E-05	0.0
Phenol	0.0	2.80E-02	0.0
Silver	538.5	1.60E+01	8,616.3
T in	689.5	3.00E-01	206.8
T itaniu m	618.0	2.90E-02	17.9
Vanadium	1,151.1	6.20E-01	713.7
Zinc	78,519.4	4.70E-02	3,690.4
Total	4,021,623		102,645

Table C-11

Pollutant Removals
Integrated and Stand-Alone Hot-Forming Subcategory
Carbon Segment- Direct Dischargers

	Pounds Removed	Toxic	Pound Equivalents (PE) Removed
		Weighting	-
Chemical Name	Option 1	Factor	Option 1
Ammonia As Nitrogen (NH3-N)	0.0	1.80E-03	0.0
Fluoride	0.0	3.50E-02	0.0
Iron	4,738,700.6	5.60E-03	26,536.7
Lead	20,199.9	2.20E+00	44,439.9
Manganese	63,449.1	7.00E-02	4,441.4
Molybdenum	49,014.4	2.00E-01	9,802.9
Zinc	42,116.6	4.70E-02	1,979.5
Total	4,913,481		87,200

Table C-12

Pollutant Removals

Non-Integrated Steelmaking and Hot-Forming Subcategory

Carbon Segment- Direct Dischargers

	Pounds Removed	Toxic Weighting	Pound Equivalents (PE) Removed
Che mical Name	Option 1	Factor	Option 1
Ammonia As Nitrogen (NH3-N)	0.0	1.80E-03	0
Iron	217,195.8	5.60E-03	1,216
Lead	14,624.4	2.20E+00	32,174
Manganese	24,779.7	7.00E-02	1,735
Silica Gel Treated-HEM (SGT-HEM)	489,788.3	0.00E+00	0
Zinc	84,422.5	4.70E-02	3,968
Total	830,811		39,092

Table C-13

Pollutant Removals

Non-Integrated Steelmaking and Hot-Forming Subcategory

Stainless Segment- Direct Dischargers

				Pound Equiva	alents (PE)
	Pounds	Removed	Toxic	Removed	
			Weighting		
Chemical Name	Option 1	Option 2	Factor	Option 1	Option 2
Aluminum	305	305	6.40E-02	19.5	19.5
Ammonia As Nitrogen (NH3-N)	0	0	1.80E-03	0.0	0.0
Antimony	14	14	4.80E-03	0.1	0.1
Boron	543	543	1.80E-01	97.8	97.7
Chromium	100	100	7.60E-02	7.6	7.6
Chromium, Hexavalent	21	21	5.10E-01	10.5	10.7
Copper	89	89	6.30E-01	56.2	56.1
Fluoride	0	0	3.50E-02	0.0	0.0
Iron	5,359	5,359	5.60E-03	30.0	30.0
Lead	4	4	2.20E+00	7.9	8.8
Manganese	543	543	7.00E-02	38.0	38.0
Molybdenum	6,771	6,771	2.00E-01	1,354.1	1,354.2
Nickel	1,067	1,067	1.10E-01	117.4	117.4
Nitrate/Nitrite (NO2 + NO3-N)	0	0	6.20E-05	0.0	0.0
Silica Gel Treated-HEM (SGT-HEM)	7,688	7,688		0.0	0.0
Titanium	4	4	2.90E-02	0.1	0.1
Zinc	2,844	2,844	4.70E-02	133.7	133.7
Total	25,350	25,352		1,873	1,874

Table C-14

Pollutant Removals

Steel Finishing Subcategory

Carbon Segment- Direct Dischargers

	D 1 D 1	T	Pound Equivalents (PE)
	Pounds Removed	Toxic Weighting	Removed
Chemical Name	Option 1	Factor	Option 1
Acetone	0.0	5.00E-06	0.0
alpha-Terpineol	0.0	1.10E-03	0.0
Aluminum	17,678.7	6.40E-02	1,131.4
Ammonia As Nitrogen (NH3-N)	0.0	1.80E-03	0.0
Antimony	6,262.5	4.80E-03	30.1
Arsenic	239.0	3.50E+00	836.4
Bis(2-ethylhexyl) Phthalate	0.0	9.50E-02	0.0
Boron	14,857.3	1.80E-01	2,674.3
Chromium	11,802.5	7.60E-02	897.0
Chromium, Hexavalent	1,571.0	5.10E-01	801.2
Copper	1,588.5	6.30E-01	1,000.7
Fluoride	0.0	3.50E-02	0.0
Iron	134,699.1	5.60E-03	754.3
Lead	1,757.7	2.20E+00	3,866.9
Manganese	11,442.0	7.00E-02	800.9
Molybdenum	5,250.3	2.00E-01	1,050.1
n-Decane	0.0	4.30E-03	0.0
n-Dodecane	0.0	4.30E-03	0.0
n-Hexadecane	0.0	4.30E-03	0.0
Nickel	8,832.7	1.10E-01	971.6
Nitrate/Nitrite (NO2 + NO3-N)	0.0	6.20E-05	0.0
Silica Gel Treated-HEM (SGT-HEM)	743,961.2	0.00E+00	0.0
Tin	3,054.6	3.00E-01	916.4
Titanium	628.1	2.90E-02	18.2
Zinc	17,301.2	4.70E-02	813.2
Total	980,926		16,563

Table C-15

Pollutant Removals
Steel Finishing Subcategory
Stainless Segment- Direct Dischargers

	Pounds Removed	Toxic	Pound Equivalents (PE) Removed
	Pounds Removed	Weighting	Removed
Chemical Name	Option 1	Factor	Option 1
Acetone	0.0	5.00E-06	0.0
Aluminum	1,948.4	6.40E-02	124.7
Ammonia As Nitrogen (NH3-N)	0.0	1.80E-03	0.0
Antimony	371.3	4.80E-03	1.8
Arsenic	39.5	3.50E+00	138.1
Barium	497.7	2.00E-03	1.0
Boron	3,738.7	1.80E-01	673.0
Chromium	2,721.2	7.60E-02	206.8
Chromium, Hexavalent	1,236.5	5.10E-01	630.6
Cobalt	273.7	1.10E-01	30.1
Copper	589.8	6.30E-01	371.5
Fluoride	1,794,014.2	3.50E-02	62,790.5
Hexanoic Acid	0.0	3.70E-04	0.0
Iron	15,389.1	5.60E-03	86.2
Lead	151.8	2.20E+00	334.0
Magnesium	642,385.9	8.70E-04	558.9
Manganese	4,983.9	7.00E-02	348.9
Molybdenum	11,459.7	2.00E-01	2,291.9
n-Dodecane	0.0	4.30E-03	0.0
n-Hexadecane	0.0	4.30E-03	0.0
Nickel	3,545.7	1.10E-01	390.0
Nitrate/Nitrite (NO2 + NO3-N)	11,193,865.2	6.20E-05	694.0
Silica Gel Treated-HEM (SGT-HEM)	149,040.1	0.00E+00	0.0
T in	137.9	3.00E-01	41.4
T itanium	108.8	2.90E-02	3.2
Total Cyanide	0.0	1.10E+00	0.0
Zinc	320.1	4.70E-02	15.0
Total	13,826,819		69,732

Table C-16

Pollutant Removals

Cokemaking Subcategory

Indirect Dischargers

							Pound Equival	ents (PE)	
		Pounds Re	emoved		Toxic		Remov	ed	
d · D	0:1	0 : 4	0 : 0	0 4	Weighting		0: 0	0 : 1	0 : 4
Chemical Name	Option 1	Option 2	Option 3	Option 4	Factor	Option 1	Option 2	Option 3	Option 4
2,4-Dimethylphenol	0.0	0.0	2,307.6	2,307.6	5.30E-03	0.0	0.0	12.2	12.2
2-Methylnaphthalene	0.0	0.0	53.4	53.4	8.00E-02	0.0	0.0	4.3	4.3
2-Phenylnaphthalene	0.0	0.0	23.5	23.5	1.50E-01	0.0	0.0	3.5	3.5
Acetone	0.0	0.0	1.4	1.4	5.00E-06	0.0	0.0	0.0	0.0
Ammonia As Nitrogen (NH3-N)	181,891.9	175,496.3	255,556.0	261,360.6	1.80E-03	327.4	315.9	460.0	470.4
Aniline	0.0	0.0	545.6	545.6	1.40E+00	0.0	0.0	763.9	763.9
Arsenic	0.0	0.0	49.7	49.7	3.50E+00	0.0	0.0	174.0	174.0
Benzene	0.0	0.0	1.8	1.8	1.80E-02	0.0	0.0	0.0	0.0
Benzo(a)anthracene	0.0	0.0	3.2	3.2	1.80E+02	0.0	0.0	574.2	574.2
Benzo(a)pyrene	0.0	0.0	8.3	8.3	4.30E+03	0.0	0.0	35,647.0	35,647.0
Benzo(b)fluoranthene	0.0	0.0	9.7	9.7	4.20E+02	0.0	0.0	4,074.0	4,074.0
Benzo(k)fluoranthene	0.0	0.0	6.3	6.3	4.20E+01	0.0	0.0	264.6	264.6
Boron	0.0	0.0	56.5	56.5	1.80E-01	0.0	0.0	10.2	10.2
Chrysene	0.0	0.0	5.3	5.3	2.10E+00	0.0	0.0	11.2	11.2
Dibenzofuran	0.0	0.0	1.3	1.3	2.00E-01	0.0	0.0	0.3	0.3
Fluoranthene	0.0	0.0	115.4	115.4	8.00E-01	0.0	0.0	92.3	92.3
Mercury	0.0	0.0	0.5	0.5	1.20E+02	0.0	0.0	64.8	64.8
n-Eicosane	0.0	0.0	38.9	38.9	4.30E-03	0.0	0.0	0.2	0.2
n-Octadecane	0.0	0.0	290.9	290.9	4.30E-03	0.0	0.0	1.3	1.3
Naphthalene	0.0	0.0	6.5	6.5	1.50E-02	0.0	0.0	0.1	0.1
Nitrate/Nitrite (NO2 + NO3-N)	0.0	0.0	1,220.2	1,220.2	6.20E-05	0.0	0.0	0.1	0.1
o-Cresol	0.0	0.0	15,421.5	15,421.5	2.70E-03	0.0	0.0	41.6	41.6
o-Toluidine	0.0	0.0	113.9	113.9	1.30E-01	0.0	0.0	14.8	14.8
p-Cresol	0.0	0.0	53,338.0	53,338.0	4.00E-03	0.0	0.0	213.4	213.4
Phenanthrene	0.0	0.0	6.2	6.2	2.90E-01	0.0	0.0	1.8	1.8
Phenol	0.0	0.0	17,489.8	17,489.8	2.80E-02	0.0	0.0	489.7	489.7
Pyrene	0.0	0.0	24.4	24.4	1.10E-01	0.0	0.0	2.7	2.7
Pyridine	0.0	0.0	20.1	20.1	1.30E-03	0.0	0.0	0.0	0.0
Selenium	0.0	0.0	1,869.8	1,869.8	1.10E+00	0.0	0.0	2,056.8	2,056.8
Total Cyanide	2,791.5	4,816.0	3,210.9	5,865.0	1.10E+00	3,070.7	5,297.6	3,532.0	6,451.5
Total	184,683	180,312	351,796	360,255		3,398	5,614	48,511	51,441

Table C-17

Pollutant Removals
Ironmaking Subcategory
Indirect Dischargers

		Pound Equivalents (PE
Pounds Removed	Toxic	Removed
	Weighting	_
Option 1	Factor	Option 1
33.20	6.40E-02	2.1
		0.0
ů		382.4
		0.2
•		1.4
		345.2
		9.7
53.75		118.3
116619.64		101.5
2630.83	7.00E-02	184.2
71.95	2.00E-01	14.4
23.28	1.10E-01	2.6
0	6.20E-05	0.0
4.3	1.10E+00	4.7
0.69	2.90E-02	0.0
0	1.10E+00	0.0
36.44	4.70E-02	1.7
133,206		1,168
	33.29 0 2124.28 3 2.27 9863.94 1738.46 53.75 116619.64 2630.83 71.95 23.28 0 4.3 0.69 0 36.44	Option 1 Weighting Factor 33.29 6.40E-02 0 1.80E-03 2124.28 1.80E-01 3 7.60E-02 2.27 6.30E-01 9863.94 3.50E-02 1738.46 5.60E-03 53.75 2.20E+00 116619.64 8.70E-04 2630.83 7.00E-02 71.95 2.00E-01 23.28 1.10E-01 0 6.20E-05 4.3 1.10E+00 0.69 2.90E-02 0 1.10E+00 36.44 4.70E-02

Table C-18

Pollutant Removals
Integrated and Stand-Alone Hot-Forming Subcategory
Carbon Segment- Indirect Dischargers

	Pounds Removed	Toxic	Pound Equivalents (PE) Removed
		Weighting	
Che mical Name	Option 1	Factor	Option 1
Ammonia As Nitrogen (NH3-N)	0.0	1.80E-03	0.0
Fluoride	0.0	3.50E-02	0.0
Iron	20,196.3	5.60E-03	113.1
Lead	2.7	2.20E+00	5.9
Manganese	170.3	7.00E-02	11.9
Molybdenum	74.2	2.00E-01	14.8
Zinc	53.4	4.70E-02	2.5
Total	20,497		148

Table C-19

Pollutant Removals
Integrated and Stand-Alone Hot-Forming Subcategory
Stainless Segment- Indirect Dischargers

	Pounds Removed	Toxic Weighting	Pound Equivalents (PE) Removed
Che mical Name	Option 1	Factor	Option 1
Antimony	1.6	4.80E-03	0
Chromium	0.7	7.60E-02	0
Copper	6.6	6.30E-01	4
Fluoride	0.0	3.50E-02	0
Iron	896.1	5.60E-03	5
Manganese	7.5	7.00E-02	1
Molybdenum	3.3	2.00E-01	1
Nickel	8.9	1.10E-01	1
T itanium	0.0	2.90E-02	0
Zinc	2.4	4.70E-02	0
Total	927		11

Table C-20

Pollutant Removals

Non-Integrated Steelmaking and Hot-Forming Subcategory

Carbon Segment- Indirect Dischargers

	Pounds Removed	Toxic Weighting	Pound Equivalents (PE) Removed
Che mical Name	Option 1	Factor	Option 1
Ammonia As Nitrogen (NH3-N)	0.0	1.80E-03	0.0
Iron	885.8	5.60E-03	5.0
Lead	14.1	2.20E+00	31.0
Manganese	38.0	7.00E-02	2.7
Silica Gel Treated-HEM (SGT-HEM)	1,498.2		0.0
Zinc	70.4	4.70E-02	3.3
T o tal	2,506		42

Table C-21

Pollutant Removals

Non-Integrated Steelmaking and Hot-Forming Subcategory

Stainless Segment-Indirect Dischargers

	Pounds		Pound Equivalents (PE
	Removed	Toxic	Removed
		Weighting	
Che mical Name	Option 1	Factor	Option 1
Aluminum	32.7	6.40E-02	2.1
Ammonia As Nitrogen (NH3-N)	0.0	1.80E-03	0.0
Antimony	6.1	4.80E-03	0.0
Boron	462.0	1.80E-01	83.2
Chromium	25.9	7.60E-02	2.0
Chromium, Hexavalent	14.6	5.10E-01	7.5
Copper	20.6	6.30E-01	13.0
Fluoride	0.0	3.50E-02	0.0
Iron	1,424.8	5.60E-03	8.0
Lead	2.2	2.20E+00	4.8
Manganese	505.9	7.00E-02	35.4
Molybdenum	7,497.7	2.00E-01	1,499.5
Nickel	758.0	1.10E-01	83.4
Nitrate/Nitrite (NO2 + NO3-N)	0.0	6.20E-05	0.0
Silica Gel Treated-HEM (SGT-HEM)	1,401.6		0.0
T itanium	0.4	2.90E-02	0.0
Zinc	850.3	4.70E-02	40.0
T o tal	13,003		1,779

Table C-22

Pollutant Removals
Steel Finishing Subcategory
Carbon Segment- Indirect Dischargers

	Pounds Removed Toxic		Pound Equivalents (PE Removed
	0 4 1	Weighting	
Che mical Name	Option 1	Factor	Option 1
Acetone	0.0	5.00E-06	0.0
alpha-Terpineol	0.0	1.10E-03	0.0
Aluminum	209.0	6.40E-02	13.4
Ammonia As Nitrogen (NH3-N)	0.0	1.80E-03	0.0
Antimony	15.1	4.80E-03	0.1
Arsenic	7.6	3.50E+00	26.7
Bis(2-ethylhexyl) Phthalate	0.0	9.50E-02	0.0
Boron	143.5	1.80E-01	25.8
Chromium	55.2	7.60E-02	4.2
Chromium, Hexavalent	265.4	5.10E-01	135.4
Copper	23.9	6.30E-01	15.1
Fluoride	0.0	3.50E-02	0.0
Iron	624.3	5.60E-03	3.5
Lead	24.6	2.20E+00	54.0
Manganese	93.3	7.00E-02	6.5
Molybdenum	92.1	2.00E-01	18.4
n-Decane	0.0	4.30E-03	0.0
n-Dodecane	0.0	4.30E-03	0.0
n-Hexadecane	0.0	4.30E-03	0.0
Nickel	154.3	1.10E-01	17.0
Nitrate/Nitrite (NO2 + NO3-N)	0.0	6.20E-05	0.0
Silica Gel Treated-HEM (SGT-HEM)	2,084.1		0.0
T in	164.0	3.00E-01	49.2
T itanium	0.9	2.90E-02	0.0
Zinc	64.5	4.70E-02	3.0
Total	4,022		372

Pollutant Removals
Steel Finishing Subcategory

Table C-23

Steel Finishing Subcategory Stainless Segment- Indirect Dischargers

	Pounds	T	Pound Equivalents (PE)
	Removed	Toxic Weighting	Removed
Che mical Name	Option 1	Factor	Option 1
Acetone	0.0	5.00E-06	0.0
alpha-Terpineol	0.0	1.10E-03	0.0
Aluminum	3.2	6.40E-02	0.2
Ammonia As Nitrogen (NH3-N)	0.0	1.80E-03	0.0
Antimony	3.3	4.80E-03	0.0
Arsenic	3.7	3.50E+00	13.0
Barium	6.2	2.00E-03	0.0
Bis(2-ethylhexyl) Phthalate	0.0	9.50E-02	0.0
Boron	47.4	1.80E-01	8.5
Chromium	30.8	7.60E-02	2.3
Chromium, Hexavalent	14.4	5.10E-01	7.3
Cobalt	1.6	1.10E-01	0.2
Copper	0.8	6.30E-01	0.5
Fluoride	15,677.5	3.50E-02	548.7
Hexanoic Acid	0.0	3.70E-04	0.0
Iron	266.2	5.60E-03	1.5
Lead	9.1	2.20E+00	20.0
M a gnesium	8,038.2	8.70E-04	7.0
Manganese	66.9	7.00E-02	4.7
Molybdenum	89.9	2.00E-01	18.0
n-Decane	0.0	4.30E-03	0.0
n-Dodecane	0.0	4.30E-03	0.0
n-Hexadecane	0.0	4.30E-03	0.0
Nickel	152.8	1.10E-01	16.8
Nitrate/Nitrite (NO2 + NO3-N)	6,648.2	6.20E-05	0.4
Silica Gel Treated-HEM (SGT-HEM)	388.4		0.0
Tin	1.0	3.00E-01	0.3
Titanium	0.2	2.90E-02	0.0
Total Cyanide	0.0	1.10E+00	0.0
Zinc	7.8	4.70E-02	0.4
Total	31,457		650

Table C-24

Baseline Pollutant Discharges
Cokemaking Subcategory
Direct Dischargers

			Pound
	Pounds of Pollutants	Toxic	Equivalents (PE)
	Discharged	Weighting	Discharged
Che mical Name	at Base line	Factor	at Base line
2,4-D ime thylphenol	245.0	5.30E-03	1.3
2-Methylnaphthalene	289.6	8.00E-02	23.2
2-Phenylnaphthalene	115.1	1.50E-01	17.3
		5.00E-06	
Acetone	467.5		0.0
Ammonia As Nitrogen (NH3-N)	359,475.4	1.80E-03	647.1
Aniline	115.8	1.40E+00	162.1
Arsenic	150.0	3.50E+00	525.0
Benzene	48.9	1.80E-02	0.9
Benzo(a)anthracene	245.0	1.80E+02	44,103.9
Benzo(a)pyrene	148.8	4.30E+03	640,039.8
Benzo(b)fluoranthene	223.7	4.20E+02	93,957.9
Benzo(k)fluoranthene	225.4	4.20E+01	9,468.3
Boron	4,371.9	1.80E-01	786.9
Chrysene	224.0	2.10E+00	470.5
D ibenzo furan	245.0	2.00E-01	49.0
Fluoranthene	245.0	7.00E-01	171.5
Mercury	3.0	1.20E+02	361.1
n-Eicosane	114.5	4.30E-03	0.5
n-O ctadecane	114.5	4.30E-03	0.5
Naphthalene	81.2	1.50E-02	1.2
Nitrate/Nitrite (NO2 + NO3-N)	1,073,761.7	6.20E-05	66.6
o-Cresol	157.5	2.70E-03	0.4
o-Toluidine	114.5	1.30E-01	14.9
p-Cresol	234.5	4.00E-03	0.9
Phenanthrene	245.0	2.90E-01	71.1
Phenol	417.3	2.80E-02	11.7
Pyrene	245.0	1.10E-01	27.0
Pyridine	116.4	1.30E-03	0.2
Se le n iu m	7,003.9	1.10E+00	7,704.3
Total Cyanide	43,849.2	1.10E+00	48,234.1
T o tal	1,493,295		846,919

Table C-25

Baseline Pollutant Discharges
Ironmaking Subcategory
Direct Dischargers

C h e mical N a m e	Pounds of Pollutants Discharged at Baseline	Toxic Weighting Factor	Pound Equivalents (PE) Discharged at Baseline
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.0	6.70E+05	326.3
1,2,3,4,7,8-Hexachlorodibenzofuran	0.0	6.70E+06	2,566.1
1,2,3,6,7,8-Hexachlorodibenzofuran	0.0	6.70E+06	2,331.6
1,2,3,7,8-Pentachlorodibenzofuran	0.0	3.30E+06	1,260.6
2,3,4,6,7,8-H exachlorodibenzo furan	0.0	6.70E+06	2,023.4
2,3,4,7,8-Pentachlorodibenzofuran	0.0	3.30E+07	16,434.0
2,3,7,8-Tetrachlorodibenzofuran	0.0	6.70E+06	1,976.5
2,4-D ime thy lphenol	82.9	5.30E-03	0.4
4-N itrophenol	772.4	9.40E-03	
Aluminum	15,197.5		7.3
		6.40E-02 1.80E-03	972.6
Ammonia As Nitrogen (NH3-N)	1,184,837.2 52.8		2,132.7
Arsenic		3.50E+00	184.9
Boron	56,310.0	1.80E-01	10,135.8
C a d miu m	77.6	2.60E+00	201.7
C hromium	451.6	7.60E-02	34.3
Copper	494.2	6.30E-01	311.4
Fluoranthene	55.4	8.00E-01	44.3
Fluoride	417,002.8	3.50E-02	14,595.1
Iron	92,089.4	5.60E-03	515.7
Lead	1,130.4	2.20E+00	2,486.9
Magnesium	2,818,725.3	8.70E-04	2,452.3
Manganese	84,085.7	7.00E-02	5,886.0
Mercury	1.5	1.20E+02	176.4
Molybdenum	1,966.7	2.00E-01	393.3
N ickel	1,002.2	1.10E-01	110.2
N itrate/Nitrite (NO2 + NO3-N)	182,926.4	6.20E-05	11.3
o-Cresol	53.8	2.70E-03	0.1
p-Cresol	59.4	4.00E-03	0.2
Phenanthrene	64.7	2.90E-01	18.8
Phenol	85.5	2.80E-02	2.4
Pyridine	363.6	1.30E-03	0.5
Se le n iu m	312.6	1.10E+00	343.9
T h a lliu m	1,452.2	1.00E+00	1,452.2
Thiocyanate	7,656.3	0.00E+00	0.0
T ita n iu m	203.7	2.90E-02	5.9
Total Cyanide	9,229.3	1.10E+00	10,152.3
Zinc	12,273.7	4.70E-02	576.9
T o ta l	4,889,017		80,124

Table C-26

Baseline Pollutant Discharges
Integrated Steelmaking Subcategory
Direct Dischargers

			Pound
	Pounds of Pollutants	Toxic	Equivalents (PE)
	Discharged	Weighting	Discharged
Che mical Name	at Base line	Factor	at Base line
A1	117, 201, 5	C 40E 02	7 442 7
Aluminum	116,291.5	6.40E-02	7,442.7
Ammonia As Nitrogen (NH3-N)	43,214.9	1.80E-03	77.8
Antimony	4,561.0	4.80E-03	21.9
Cadmium	541.0	2.60E+00	1,406.6
Chromium	1,102.8	7.60E-02	83.8
Cobalt	1,089.7	1.10E-01	119.9
Copper	1,939.5	6.30E-01	1,221.9
Fluoride	2,910,515.8	3.50E-02	101,868.1
Iron	631,620.8	5.60E-03	3,537.1
Lead	6,987.1	2.20E+00	15,371.5
Magnesium	2,142,726.3	8.70E-04	1,864.2
Manganese	32,416.4	7.00E-02	2,269.1
Mercury	21.8	1.20E+02	2,616.5
Molybdenum	41,681.1	2.00E-01	8,336.2
Nitrate/Nitrite (NO2 + NO3-N)	101,080.8	6.20E-05	6.3
Phenol	2,542.0	2.80E-02	71.2
Silver	655.7	1.60E+01	10,491.2
T in	817.2	3.00E-01	245.2
T itanium	764.2	2.90E-02	22.2
Vanadium	1,422.6	6.20E-01	882.0
Zinc	90,862.3	4.70E-02	4,270.5
Total	6,132,855		162,226

Table C-27

Baseline Pollutant Discharges
Integrated and Stand-Alone Hot-Forming Subcategory
Carbon Segment- Direct Dischargers

			Pound
	Pounds of Pollutants	Toxic	Equivalents (PE)
	Discharged	Weighting	Discharged
Che mical Name	at Base line	Factor	at Base line
Ammonia As Nitrogen (NH3-N)	571,086.7	1.80E-03	1,028.0
Fluoride	5,662,446.4	3.50E-02	198,185.6
Iron	5,336,311.3	5.60E-03	29,883.3
Lead	21,979.4	2.20E+00	48,354.7
Manganese	69,860.1	7.00E-02	4,890.2
Molybdenum	61,543.7	2.00E-01	12,308.7
Zinc	48,810.1	4.70E-02	2,294.1
Total	11,772,038		296,945
10111	11,772,030		270,743

Baseline Pollutant Discharges
Non-Integrated Steelmaking and Hot-Forming Subcategory
Carbon Segment- Direct Dischargers

Table C-28

		Pound
Pounds of Pollutants	Toxic	Equivalents (PE)
Discharged	Weighting	Discharged
at Base line	Factor	at Base line
09 410 2	1 20E 02	177.2
,		
,		1,326.0
14,636.5	2.20E+00	32,200.2
26,672.0	7.00E-02	1,867.0
525,910.3	0.00E+00	0.0
86,994.7	4.70E-02	4,088.8
989,415		39,659
	Discharge d at Base line 98,419.3 236,782.0 14,636.5 26,672.0 525,910.3 86,994.7	Discharge d at Base line Factor 98,419.3 1.80E-03 236,782.0 5.60E-03 14,636.5 2.20E+00 26,672.0 7.00E-02 525,910.3 0.00E+00 86,994.7 4.70E-02

Table C-29

Baseline Pollutant Discharges

Non-Integrated Steelmaking and Hot-Forming Subcategory

Stainless Segment- Direct Dischargers

			Pound
	Pounds of Pollutants	Toxic	Equivalents (PE)
	Discharged	Weighting	Discharged
Che mical Name	at Base line	Factor	at Base line
Aluminum	590.1	6.40E-02	37.8
Ammonia As Nitrogen (NH3-N)	1,119.8	1.80E-03	2.0
Antimony	26.1	4.80E-03	0.1
Boron	1,085.4	1.80E-01	195.4
Chromium	200.3	7.60E-02	15.2
Chromium, Hexavalent	51.4	5.10E-01	26.2
Copper	159.0	6.30E-01	100.2
Fluoride	20,324.7	3.50E-02	711.4
Iron	9,628.7	5.60E-03	53.9
Lead	6.5	2.20E+00	14.3
Manganese	952.8	7.00E-02	66.7
Molybdenum	11,629.2	2.00E-01	2,325.8
N ick e l	1,883.0	1.10E-01	207.1
Nitrate/Nitrite (NO2 + NO3-N)	257.9	6.20E-05	0.0
Silica Gel Treated-HEM (SGT-HEM)	14,128.8	0.00E+00	0.0
T itanium	7.9	2.90E-02	0.2
Zinc	4,884.8	4.70E-02	229.6
Total	66,936		3,986

Table C-30

Baseline Pollutant Discharges
Steel Finishing Subcategory
Carbon Segment- Direct Dischargers

			Pound
	Pounds of Pollutants	Toxic	Equivalents (PE)
	Discharged	Weighting	Discharged
Che mical Name	at Base line	Factor	at Base line
Acetone	41,034.7	5.00E-06	0.2
alpha-Terpineol	6,898.0	1.10E-03	7.6
Aluminum	28,690.6	6.40E-02	1,836.2
Ammonia As Nitrogen (NH3-N)	440,173.7	1.80E-03	792.3
Antimony	9,439.8	4.80E-03	45.3
Arsenic	403.1	3.50E+00	1,410.9
B is(2-e th y lh e x y l) P h th a late	2,335.0	9.50E-02	221.8
Boron	23,139.7	1.80E-01	4,165.1
Chromium	18,498.2	7.60E-02	1,405.9
Chromium, Hexavalent	2,593.3	5.10E-01	1,322.6
Copper	2,589.5	6.30E-01	1,631.4
Fluoride	395,497.6	3.50E-02	13,842.4
Iron	214,253.8	5.60E-03	1,199.8
Lead	2,990.2	2.20E+00	6,578.4
Manganese	17,872.2	7.00E-02	1,251.1
Molybdenum	7,894.1	2.00E-01	1,578.8
n-Decane	2,334.0	4.30E-03	10.0
n-Dodecane	2,363.4	4.30E-03	10.2
n-Hexadecane	2,441.0	4.30E-03	10.5
N ick e l	17,070.8	1.10E-01	1,877.8
Nitrate/Nitrite (NO2 + NO3-N)	367,172.0	6.20E-05	22.8
Silica Gel Treated-HEM (SGT-HEM)	1,256,414.1	0.00E+00	0.0
T in	4,816.0	3.00E-01	1,444.8
T itanium	1,053.5	2.90E-02	30.6
Zinc	25,557.6	4.70E-02	1,201.2
T o ta l	2,893,526		41,898

Table C-31

Baseline Pollutant Discharges
Steel Finishing Subcategory
Stainless Segment- Direct Dischargers

			Pound
	Pounds of Pollutants	Toxic	Equivalents (PE)
	Discharged	Weighting	Discharged
Chemical Name	at Base line	Factor	at Base line
Acetone	2,753.5	5.00E-06	0.0
Aluminum	4,087.3	6.40E-02	261.6
Ammonia As Nitrogen (NH3-N)	905,317.6	1.80E-03	1,629.6
Antimony	694.1	4.80E-03	3.3
Arsenic	84.0	3.50E+00	294.1
Barium	972.9	2.00E-03	1.9
Boron	7,397.8	1.80E-01	1,331.6
Chromium	5,509.2	7.60E-02	418.7
Chromium, Hexavalent	2,189.6	5.10E-01	1,116.7
Cobalt	592.7	1.10E-01	65.2
Copper	1,197.0	6.30E-01	754.1
Fluoride	3,662,601.7	3.50E-02	128,191.1
Hexanoic Acid	783.1	3.70E-04	0.3
Iron	25,041.5	5.60E-03	140.2
Lead	329.6	2.20E+00	725.2
Magnesium	1,047,784.4	8.70E-04	911.6
Manganese	8,047.8	7.00E-02	563.3
Molybdenum	22,662.8	2.00E-01	4,532.6
n-Dodecane	980.3	4.30E-03	4.2
n-Hexadecane	1,340.1	4.30E-03	5.8
Nickel	5,909.0	1.10E-01	650.0
Nitrate/Nitrite (NO2 + NO3-N)	24,630,080.9	6.20E-05	1,527.1
Silica Gel Treated-HEM (SGT-HEM)	323,829.5	0.00E+00	0.0
T in	264.3	3.00E-01	79.3
T ita n iu m	228.4	2.90E-02	6.6
Total Cyanide	114,007.3	1.10E+00	125,408.0
Zinc	632.6	4.70E-02	29.7
T o ta l	30,775,319		268,652

Table C-32

Baseline Pollutant Discharges
Cokemaking Subcategory
Indirect Dischargers

			Pound
	Pounds of Pollutants	Toxic	Equivalents (PE)
	Discharged	Weighting	Discharged
Che mical Name	at Base line	Factor	at Base line
2,4-D ime thy lphenol	2,328.0	5.30E-03	12.3
2-Methy lnaphthalene	83.4	8.00E-02	6.7
2-P heny lnaphthalene	29.8	1.50E-01	4.5
Acetone	11.7	5.00E-06	0.0
Ammonia As Nitrogen (NH3-N)	262,064.6	1.80E-03	471.7
Aniline	548.6	1.40E+00	768.0
Arsenic	60.4	3.50E+00	211.2
Benzene	2.2	1.80E-02	0.0
Benzo(a)anthracene	4.0	1.80E+02	723.6
Benzo(a)pyrene	9.9	4.30E+03	42,441.0
Benzo(b)fluoranthene	12.4	4.20E+02	5,208.0
Benzo(k)fluoranthene	9.0	4.20E+01	378.4
Boron	1,104.7	1.80E-01	198.9
Chrysene	6.6	2.10E+00	13.8
D ibenzo furan	2.2	2.00E-01	0.4
Fluoranthene	139.6	8.00E-01	111.7
Mercury	0.6	1.20E+02	76.8
n-Eicosane	42.3	4.30E-03	0.2
n-O ctadecane	302.9	4.30E-03	1.3
N aphthalene	8.7	1.50E-02	0.1
Nitrate/Nitrite (NO2 + NO3-N)	7,554.3	6.20E-05	0.5
o-Cresol	15,447.4	2.70E-03	41.7
o-T o lu id in e	120.5	1.30E-01	15.7
p-Cresol	53,349.6	4.00E-03	213.4
Phenanthrene	8.3	2.90E-01	2.4
Phenol	17,497.2	2.80E-02	489.9
Pyrene	31.0	1.10E-01	3.4
Pyridine	22.2	1.30E-03	0.0
Se le n ium	2,168.5	1.10E+00	2,385.3
Total Cyanide	7,244.0	1.10E+00	7,968.4
Total	370,214		61,749

Table C-33

Baseline Pollutant Discharges
Ironmaking Subcategory
Indirect Dischargers

		Pound
Pounds of Pollutants	Toxic	Equivalents (PE)
Discharged	Weighting	Discharged
at Base line	Factor	at Base line
		2.3
·	1.80E-03	93.0
2,180.3	1.80E-01	392.4
3.3	7.60E-02	0.2
2.5	6.30E-01	1.6
10,780.7	3.50E-02	377.3
1,832.1	5.60E-03	10.3
54.5	2.20E+00	120.0
121,318.3	8.70E-04	105.5
2,670.6	7.00E-02	186.9
78.3	2.00E-01	15.7
24.9	1.10E-01	2.7
580.9	6.20E-05	0.0
4.7	1.10E+00	5.2
0.7	2.90E-02	0.0
184.9	1.10E+00	203.4
39.8	4.70E-02	1.9
191,467		1,519
	Discharge d at Base line 36.4 51,674.2 2,180.3 3.3 2.5 10,780.7 1,832.1 54.5 121,318.3 2,670.6 78.3 24.9 580.9 4.7 0.7 184.9 39.8	Discharged at Baseline Weighting Factor 36.4 6.40E-02 51,674.2 1.80E-03 2,180.3 1.80E-01 3.3 7.60E-02 2.5 6.30E-01 10,780.7 3.50E-02 1,832.1 5.60E-03 54.5 2.20E+00 121,318.3 8.70E-04 2,670.6 7.00E-02 78.3 2.00E-01 24.9 1.10E-01 580.9 6.20E-05 4.7 1.10E+00 0.7 2.90E-02 184.9 1.10E+00 39.8 4.70E-02

Table C-34

Baseline Pollutant Discharges
Integrated and Stand-Alone Hot-Forming Subcategory
Carbon Segment- Indirect Dischargers

			Pound
	Pounds of Pollutants	Toxic	Equivalents (PE)
	Discharged	Weighting	Discharged
Che mical Name	at Base line	Factor	at Base line
Ammonia As Nitrogen (NH3-N)	1,815.2	1.80E-03	3.3
Fluoride	11,554.6	3.50E-02	404.4
Iron	23,852.6	5.60E-03	133.6
Lead	4.2	2.20E+00	9.2
Manganese	209.3	7.00E-02	14.7
Molybdenum	114.0	2.00E-01	22.8
Zinc	71.8	4.70E-02	3.4
Total	37,622		591

Table C-35

Baseline Pollutant Discharges
Integrated and Stand-Alone Hot-Forming Subcategory
Stainless Segment- Indirect Dischargers

			Pound
	Pounds of Pollutants	Toxic	Equivalents (PE)
	Discharged	Weighting	Discharged
Che mical Name	at Base line	Factor	at Base line
Antimony	1.7	4.80E-03	0.0
Chromium	0.8	7.60E-02	0.1
Copper	7.0	6.30E-01	4.4
Fluoride	387.1	3.50E-02	13.5
Iron	955.2	5.60E-03	5.3
Manganese	8.2	7.00E-02	0.6
Molybdenum	3.7	2.00E-01	0.7
N ick e l	9.9	1.10E-01	1.1
T ita n iu m	0.0	2.90E-02	0.0
Zinc	2.7	4.70E-02	0.1
T o tal	1,376		26
10141	1,570		20

Baseline Pollutant Discharges
Non-Integrated Steelmaking and Hot-Forming Subcategory
Carbon Segment- Indirect Dischargers

Table C-36

			Pound
	Pounds of Pollutants	Toxic	Equivalents (PE)
	Discharged	Weighting	Discharged
Che mical Name	at Base line	Factor	at Base line
Ammonia As Nitrogen (NH3-N)	1,552.2	1.80E-03	2.8
Iron	1,341.1	5.60E-03	7.5
Lead	14.6	2.20E+00	32.0
Manganese	121.2	7.00E-02	8.5
Silica Gel Treated-HEM (SGT-HEM)	2,164.0		0.0
Zinc	83.9	4.70E-02	3.9
Total	5,277		55

Table C-37

Baseline Pollutant Discharges

Non-Integrated Steelmaking and Hot-Forming Subcategory

Stainless Segment-Indirect Dischargers

		Pound Equivalents (PE)
Pounds of Pollutants	Toxic	
Discharged	Weighting	Discharged
at Base line	Factor	at Base line
25 /	6.40E.02	2.3
	*****	1.1
-,		
		0.0
		90.6
,,		2.1
		8.2
21.6	6.30E-01	13.6
836.4	3.50E-02	29.3
1,530.4	5.60E-03	8.6
2.3	2.20E+00	5.1
543.5	7.00E-02	38.0
8,044.9	2.00E-01	1,609.0
803.2	1.10E-01	88.3
53.6	6.20E-05	0.0
1,509.3		0.0
0.5	2.90E-02	0.0
891.1	4.70E-02	41.9
15,418		1,938
	Discharge d at Base line 35.4 592.3 6.8 503.4 27.2 16.0 21.6 836.4 1,530.4 2.3 543.5 8,044.9 803.2 53.6 1,509.3 0.5 891.1	Discharge d at Base line 35.4 6.40E-02 592.3 1.80E-03 6.8 4.80E-03 503.4 1.80E-01 27.2 7.60E-02 16.0 5.10E-01 21.6 6.30E-01 836.4 3.50E-02 1,530.4 5.60E-03 2.3 2.20E+00 543.5 7.00E-02 8,044.9 2.00E-01 803.2 1.10E-01 53.6 6.20E-05 1,509.3 0.5 2.90E-02 891.1 4.70E-02

Table C-38

Baseline Pollutant Discharges
Steel Finishing Subcategory
Carbon Segment- Indirect Dischargers

			Pound
	Pounds of Pollutants	Toxic	Equivalents (PE)
	Discharged	Weighting	Discharged
Chemical Name	at Base line	Factor	at Base line
Acetone	40.4	5.00E-06	0.0
alpha-Terpineol	21.3	1.10E-03	0.0
Aluminum	375.1	6.40E-02	24.0
Ammonia As Nitrogen (NH3-N)	8,980.3	1.80E-03	16.2
Antimony	51.7	4.80E-03	0.2
Arsenic	25.3	3.50E+00	88.7
Bis(2-ethylhexyl) Phthalate	92.4	9.50E-02	8.8
Boron	384.6	1.80E-01	69.2
Chromium	127.8	7.60E-02	9.7
Chromium, Hexavalent	590.6	5.10E-01	301.2
Copper	87.7	6.30E-01	55.3
Fluoride	2,856.1	3.50E-02	100.0
Iron	1,196.2	5.60E-03	6.7
Lead	84.8	2.20E+00	186.6
Manganese	186.5	7.00E-02	13.1
Molybdenum	248.8	2.00E-01	49.8
n-Decane	304.4	4.30E-03	1.3
n-Dodecane	16.5	4.30E-03	0.1
n-Hexadecane	92.1	4.30E-03	0.4
Nickel	410.9	1.10E-01	45.2
Nitrate/Nitrite (NO2 + NO3-N)	410.4	6.20E-05	0.0
Silica Gel Treated-HEM (SGT-HEM)	6,683.6		0.0
T in	571.4	3.00E-01	171.4
T itanium	2.6	2.90E-02	0.1
Zinc	221.5	4.70E-02	10.4
Total	24,063		1,158

Table C-39

Baseline Pollutant Discharges
Steel Finishing Subcategory
Stainless Segment- Indirect Dischargers

			Pound
	Pounds of Pollutants	Toxic	Equivalents (PE)
	Discharged	Weighting	Discharged
Chemical Name	at Base line	Factor	at Base line
Acetone	10.5	5.00E-06	0.0
alpha-Terpineol	0.2	1.10E-03	0.0
Aluminum	17.3	6.40E-02	1.1
Ammonia As Nitrogen (NH3-N)	22,090.6	1.80E-03	39.8
Antimony	8.4	4.80E-03	0.0
Arsenic	8.0	3.50E+00	27.9
Barium	36.7	2.00E-03	0.1
Bis(2-ethylhexyl) Phthalate	2.1	9.50E-02	0.2
Boron	232.3	1.80E-01	41.8
Chromium	68.6	7.60E-02	5.2
Chromium, Hexavalent	62.6	5.10E-01	31.9
Cobalt	16.8	1.10E-01	1.9
Copper	209.5	6.30E-01	132.0
Fluoride	168,026.4	3.50E-02	5,880.9
Hexanoic Acid	3.7	3.70E-04	0.0
Iron	603.4	5.60E-03	3.4
 Lead	29.5	2.20E+00	64.8
Magnesium	22,383.1	8.70E-04	19.5
Manganese	108.7	7.00E-02	7.6
Molybdenum Molybdenum	439.1	2.00E-01	87.8
n-Decane	3.0	4.30E-03	0.0
n-Dodecane	1.5	4.30E-03	0.0
n-Hexadecane	11.2	4.30E-03	0.0
N ick e l	204.4	1.10E-01	22.5
Nitrate/Nitrite (NO2 + NO3-N)	90,138.3	6.20E-05	5.6
Silica Gel Treated-HEM (SGT-HEM)	1,675.6		0.0
T in	11.4	3.00E-01	3.4
T itanium	0.7	2.90E-02	0.0
Total Cyanide	526.6	1.10E+00	579.3
Zinc	20.4	4.70E-02	1.0
Total	306,951		6,958